RAILROAD GAZETTE

FRIDAY, MARCH 21.

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Contributions.

The Hudson River Tunnel.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In writing last week of the new method of carrying on the work in the Hudson River tunnel, I said the shield will be forced forward by sixteen 20-ton hydraulic rams. I received after your paper had gone to press the statement from Mr. Hutton that the rams are eight inches diameter and arranged to work to two tons per sq. in. This will give 100 tons per ram or 1,600 tons for the whole battery. Obviously something will have to move.

S. D. V. BURR.

Suburban Business of the Burlington.

CHICAGO, March 17, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I note in an editorial on page 181 of the *Railroad Gazette* of March 14 that you refer to the Chicago, Burlington & Quincy as doing little or no suburban business out of Chicago. Knowing that you are untiring in your efforts to present the news correctly to your many subscribers, I take the liberty to inclose herewith a suburban time card of the "Q." to show that the article referred to is a little off. While it is true that the "Q." is running its trains as fast as usual, the road sh ould be classed as among those doing a big suburban business, as a little study of the card will show. O. K.

[Our readers will hardly need to be told that the time-table sent by our correspondent shows 27 trains into Chicago and 26 out every day except Sunday. We did not say, or intend to say, that the Burlington did little or no suburban business, but we confess that the careless language used admits of that construction.—EDITOR RAILROAD GAZETTE.]

Party Rates and Free Trains.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I see by the *Railroad Gazette* of March 14 that the Pennsylvania Railroad has made Mr. A. M. Palmer a present of $500, more or less, in the shape of a special train to carry his theatrical party from New York to Washington and back. You make mention of the business sagacity of this little stroke and seem to commend it, or at least do not express any disapproval. It looks to the outsider, however, as though this road had deliberately violated the national law against discrimination. By what right does the company carry this crowd free, while charging other similar concerns regular rates? or, if it passes all actors free, where is the justice in favoring Mr. Palmer by saving him and his company a whole day's time without making any extra charge for it? Certainly the spirit of Commissioner Veazey's late decision on party rates is against giving the least advantage to one passenger over another, whether he be in a theatrical company or is simply an individual theatrical tramp, or a plain citizen. And, whether this decision be sound or not, the law itself apparently applies to a case of this kind if it covers anything. Section 2 of the act to regulate commerce says that if any carrier shall "directly or indirectly by any special rate or other device collect or receive," etc. Carrying a party for nothing may not be a special rate, but it is in the nature of a reduction, to all intents and purposes. Section 22 says that *property* may be carried free for charitable purposes, but it does not authorize the carrying of *persons* for less than regular rates on that account, except in specified instances, and in any event it requires a pretty liberal construction to class the running of this train as a charitable operation. The Actors' fund is, no doubt, charitable in name, but if the Pennsylvania makes $500 contributions to it the road must in justice be indebted in large sums to the almshouses at all towns along its line. It seems to me that if the Interstate Commerce Commission wishes to take up the question of right and wrong as related to free passes, here is a good opportunity. G.

Ventilation or Refrigeration.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to Mr. Pancoast's letter in your issue of March 14, on the transportation of green produce, he intends to convey the idea that ventilation will carry such produce. As it is merely a theory with him, let us see what his theory is based on. He says, "Fruits rarely decay on the parent tree, even in the hottest weather," and goes on to say that with the same conditions maintained in transportation, the fruits will reach their destination in the same condition as when on the tree. It may be that the gentleman intends to take the tree up bodily, roots and all, and deliver the crop hanging on the tree in New York. As an ordinary orange tree has four or five boxes of fruit to the tree it would require a great many carloads of trees to bring the orange crop of Florida to New York.

The fruit does not decay on the tree, in spite of the changing temperature of night and day, because it is alive and sustained by circulation of the sap. Again, he says, "Is it not the unremoved heat, sweat, etc," which causes the decay of fruit in transportation? It certainly is, and it is only by proper refrigeration that this heat, sweat, etc., can be removed from the fruit. So long as these gases and heat remain in the fruit when packed in boxes for shipment, so long will they generate decay. It is the province, and has been the result of shipments under refrigeration, that these gases, heat and sweat are removed from fruit. The staff of your paper assisted last year in testing a lot of oranges brought from California in refrigeration. You know that they kept as long in your office after arriving as the temptation of such fruit to the people in your office would permit. Many other instances could be cited of the success of transportation of other varieties of fruit under proper refrigeration. REFRIGERATOR.

[Refrigerator's fun is of fairly good quality, and his oranges were prime. But after all he only answers Mr. Pancoast "by indirection." Mr. Pancoast's point was, that fruit, hanging freely exposed in the air, keeps well long after it has ripened and ceased to draw nourishment from the tree.—EDITOR RAILROAD GAZETTE.]

The Responsibilities of Fast Time.

Providence, R. I., March 15, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The Railroad Committee of the Massachusetts Legislature has just killed a proposition to enact a law requiring faster trains between Boston and New York. A bill proposed by Senator Quincy rehearsed the fact that the trains which run through by the Boston & Albany (long route), 234 miles in six hours, have to make a higher rate of speed than do those making the same time over the New York & New England (short) route, 213 miles, and that the interests of the public demand that the highest rate of speed maintained over any portion of either one of the lines should be kept up over the whole length of all of them. The committee has done a wise thing and its action sustains the enviable record of that state as the most conservative as well as the most enterprising in the Union in its regulation of railroads.

Aside from the absurdity of making a law on such a point and the impossibility of enforcing one if made, the decision is based on sound principles of common sense. The American mania for fast time has outrun all bounds of reason, and it is high time to call a halt if we only had an authority to issue such a call. In default of this necessary remedy it is at least encouraging to witness a refusal to further aid this movement. Look at our great Western roads. With level country to run through, which means cheaply built and cheaply operated roads, fast trains have been very easily provided. On a new road, with new cars and engines, in daylight, fast time can be made with considerable safety, and the percentage of accidents has been so small that the pace was set years ago at a point considerably higher than it ought to be if it is to be used as a permanent standard, *for night and day*, with light trains and heavy, and with old rails and new, taking them as they run. This very cheapness of construction led to the building of competing lines, and so we have to-day the spectacle of roads of 100, 200 and 500 miles long racing each other regardless of danger, while they have neglected some of the most obvious requirements of a safe railroad for fast running.

In competition, the most obvious expedients to gain trade are those which appeal most strongly to the passenger, and therefore, next after fast time, the roads have spent their money to provide gorgeous cars. The passenger sees this elegance—a positive quality—every time he rides, and does not see the *negative* factor which exists in the lack of guard rails on bridges, of distant signals and of track watchmen. These points only come out in a two-inch newspaper item once in a year or two when some train runs off the track. From almost any Western city you can go to almost any other in a comfortable car, with attentive porters, sumptuous meals in dining cars, and in quick time. Hundreds of passengers go nightly from Chicago to Buffalo, Cincinnati, Louisville, St. Louis, Kansas City, Omaha and St. Paul under substantially the same easy conditions with which they would retire to bed at the Grand Pacific Hotel and rise for breakfast in the morning; and it must be admitted that they do this with a high comparative degree of safety. Only one passenger out of many hundred thousand is killed.

But you or I, in considering this question, must look at it somewhat as though we were to be among the small number of unlucky ones. To blindly assume that we shall always belong to the great majority because we always have belonged to it is folly. In contrast with this *comparative* degree of safety, look at the almost perfect security attained by English railroads. In 1888 the railroads of Great Britain carried 842 millions of passengers, and only one in 80 millions of these was killed. I for one am enough of an Anglomaniac to advocate the adoption of English standards here, and I interpret this action of the Massachusetts Legislature as a notice to the railroads that they must lift themselves up to such a standard before the law will recognize the propriety of running any faster than the speeds now common. I have seen in your paper statements to the effect that the Boston & Albany had eliminated a large number of its facing-point switches, and that all, or nearly all, of these dangerous devices left in the main track had been provided with distant signals. I believe also that the New York, Providence & Boston, which is one of the most enterprising roads in this part of the country, also has a large number of electric signals to protect switches as well as a good many miles of automatic block signals; but aside from these two sections, the routes between New York and Boston are all dotted with danger traps of various kinds which ought to be abated. Facing-point switches and stub switches are too numerous to mention, and grade crossings of other railroads with nothing but the most primitive devices for signaling are also to be found in several places. Unless one sets a very high value on his time he certainly should prefer to spend seven hours between these two cities rather than try to make it in five or six, when the latter involves a high speed over these numerous pitfalls.

Another thing in which the public is interested and which is also of vital importance to the railroads, financially and otherwise, is the unprotected condition of the road crossings. The passenger in the cars is perhaps not directly affected if the locomotive of his train demolishes a carriage or two with its occupants during a trip, but the present state of things is a great hindrance to fast running nevertheless. With the numerous automatic bell devices now on the market provided for the purpose of giving adequate warning of the approach of fast trains at crossings, it is barbarous to run trains at the speeds now common without any protection to teams. We cannot, perhaps, adopt the English standard of overhead bridges, but we ought at least to have the bells. I read that England has now made the proper protection of switches compulsory, and whatever may be said about the great body of American roads, it certainly is reasonable to expect that the lines through this thickly settled territory, between the two principal cities of the Union, should come up to the very best standard. S. W. E.

Counterbalance in Three-Cylinder Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am very much obliged to you for giving space to my letter in your issue of Dec. 20, and while I must acknowledge with thanks, being set right in certain of statements, I beg to make another and final plea for the three-cylinder engine, arranged as suggested, with three cylinders of equal size, the high-pressure cylinder inside connected and the two low-pressure cylinders outside connected.

It must be admitted that the reciprocating parts would not be self-balancing on this type of engine, but even granting that the reciprocating parts to be counterbalanced for each cylinder are as heavy as in the present type of engine, I think I can show:

First—That the total counterbalance for the three cylinders is considerably less than it would be for two cylinders with 90-degree cranks.

Second—That those counterweights being diametrically opposite each other relative to the axle, the resultant effect of the right and left counterweights in producing an excess in load over the static load is nil, and

Third—That the nosing of the engine can be entirely overcome.

Figure 1 shows diagramatically the three cranks and their respective counterweights, which we will assume to be equal in weight. The counterweight M' for the middle crank will, of course, be divided equally between the right and left driving wheels, so that we shall have in practice one resultant counterweight on each driving wheel on the line AB, each of which, according to my arithmetic, is only seven-eighths either of the counterweights M', R', or L'.

Figure 2 will serve to show typical curves of pressure produced by counterweights of an engine with 90-degree cranks, and it will be noticed that as these curves of pressure for the right and left drivers follow each other only a quarter of a revolution apart, there is produced a resultant pressure on bridges and substructures, illustrated by the higher curves in the figure, two of which are drawn in broken lines. Now, with the three-cylin-

der engine in question, as the counterweights are an entire half revolution apart, the resultant effect of right and left driving wheels becomes a straight line, and the total pressure on bridges and substructures does not exceed the static load.

To prevent the nosing, I would use the method described by Professor Gaetano Lanza in a paper before the American Society of Mechanical Engineers, reprinted in your columns Oct. 19, 1888. The objection to using this ingenious method on the 90-degree crank engine, is that it slightly increases the counterweight on the wheels, and hence the pounding, but with the engine proposed, this method could be used with advantage, only very slightly increasing the counterweight on each wheel, and drawing the centres of the proper weight slightly out of the line *A B*, so that they would be somewhat less than 180 degrees apart.

In addition to these advantages over the 90-degree crank engine, there would, of course, be those mentioned in your editorial, and also the minor, yet important advantages, that the cylinders being comparatively small, the main rod bearing on the right and left cranks, will be close to the wheel, and that the outside cylinders,

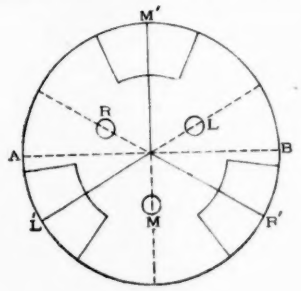


Fig. 1.

being for low pressure and of small diameter, the reciprocating parts need not be made very heavy.

I am not competent, nor have I the time to work out the details of an engine, such as I have suggested. I have simply sought to answer the objections you have made, without wishing to pretend that there may not be others more vital and unanswerable. TENAX.

[Our correspondent has brought out a very interesting point, and his argument is worth attention because it has new features and is the result of careful investigation. It may be well, however, to more fully explain his plan. In fig. 1, it will be seen that the counterweight for the middle crank *M* will have to be placed half in each wheel, and there will, therefore, be two counterweights or their equal in each driver, one at *M'* the other at *L'* or *R'* as the case may be. It is evident, as far as the simple balancing of revolving parts is concerned, that these two balances can be combined in one which will produce the same resultant centrifugal force, and in the same resultant direction from the centre of the wheel as will the two separate balances. This single balance is the one referred to by "Tenax" as the "resultant balance," and when the balances are all equal and the half-centre balance in each wheel is just one-half of the outside balance in that wheel, the location of the resultant balance will be on the line *A B*, and its amount will be as stated by "Tenax," *i. e.*: ⅔ of one balance such as *L'* or *R'*. This makes clear the method of determining and locating the balances. With regard to the meaning of the curves it is only necessary to add that they represent the amount of the centrifugal force of the total balance which acts on the rail. They show the variation of load on the rail in an actual case, as the wheels revolve at the speeds given. The amount of the load is given by the height of the curve above the base line at zero.

The first claim of our correspondent that less balance would be used under the system of balancing which he suggests will be readily admitted. The second is not true for the load on individual panels, posts, girders, stringers or rails of a bridge or even on an individual chord because there is still a great excess of pressure on the individual wheels, and therefore on the parts under those wheels, even while the opposite wheel may have a tendency to lift and make the total load, on the bridge as a whole, practically uniform. As the injury to track is made individually by each wheel the advantage of the proposed method of balancing is not pronounced, except it be to relieve the possibility of injury to a bridge by running upon it a load that might oscillate in the same time as the natural oscillation of the bridge itself, and therefore set up injurious vibrations. However, this is a delicate point, and little understood, and therefore it may be best to confine ourselves more particularly to the rail pressures which are easily seen to be disastrous in case of high speed and insufficiently balanced or over balanced engines. With regard to the third claim, there is a chance for argument, and to satisfactorily state the exact effect of this method of balancing requires the use of diagrams and considerable space. We shall return to this part of the subject in a later issue. "Tenax" speaks of the advantage in the three-cylinder compound of bringing the main rod bearing close to the wheel because of the small diameter of the cylinders. This is quite true of those compounds that are made from existing engines without altering the front frames, but scarcely so of the new designs, where the frames can be moved inward at the front to permit any reasonable lateral spacing of the cylinders.—EDITOR RAILROAD GAZETTE.]

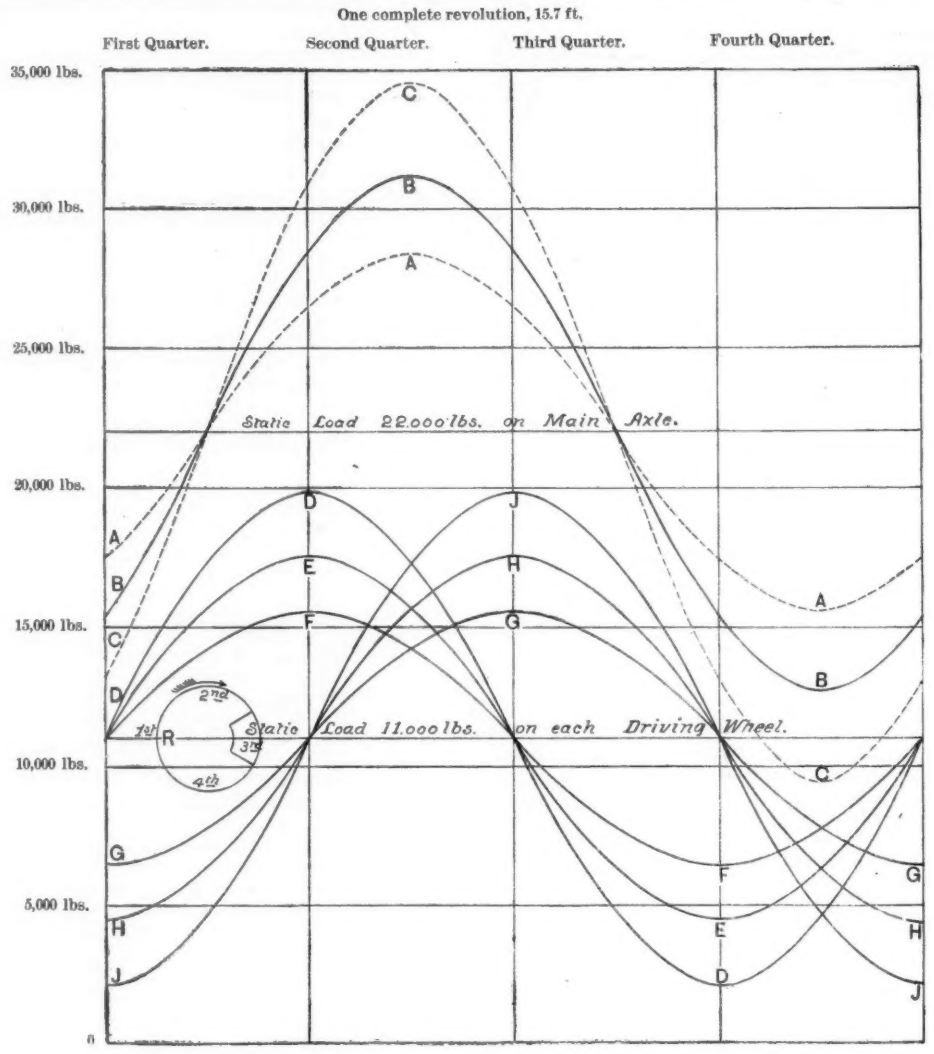


Fig. 2.

Typical Curves of Pressure Produced by Counterweights on Engine Drivers of an 8-wheel American Locomotive with 5-ft. Drivers.

Resultant Curves.			*Individual Wheel Pressures.*			
A, at 50 miles per hour	maximum, 28,420 lbs.		*D*, at 70 miles per hour—right wheel	maximum,	19,896 lbs.	
	minimum, 15,580 "		*E*, at 60 " " "	"	17,541 "	
B, at 60 " "	maximum, 31,250 "		*F*, at 50 " " "	"	15,540 "	
	minimum, 12,700 "		*G*, at 50 " " —left wheel			
C, at 70 " "	maximum, 34,580 "		*H*, at 60 " " "			
	minimum, 9,420 "		*J*, at 70 " " "			

The Calumet & Hecla Mining Co.'s New Hoisting Plant.

BY F. W. DEAN.

The new hoisting plant which the Calumet & Hecla Mining Co. has recently built is the most elaborate and complete ever erected. It is entirely isolated, and thus, in its design, was not hampered by connection with anything else.

It consists of three triple-expansion, vertical, inverted beam engines with the crank shaft at one side, and these, with all of the hoisting plant, boilers, chimney and accessories, including hydraulic gear for operating the drums, accumulator, damper regulators, etc., etc., were designed by the distinguished engineer of the company, Mr. E. D. Leavitt.

The working steam pressure is 185 lbs. per sq. in. by gauge, and the hydraulic pressure, 400 lbs. per sq. in. as a maximum. The steam is furnished by five Belpaire locomotive type boilers, which will be described in detail further on. The boilers and hydraulic system are fed by Worthington pressure pumps.

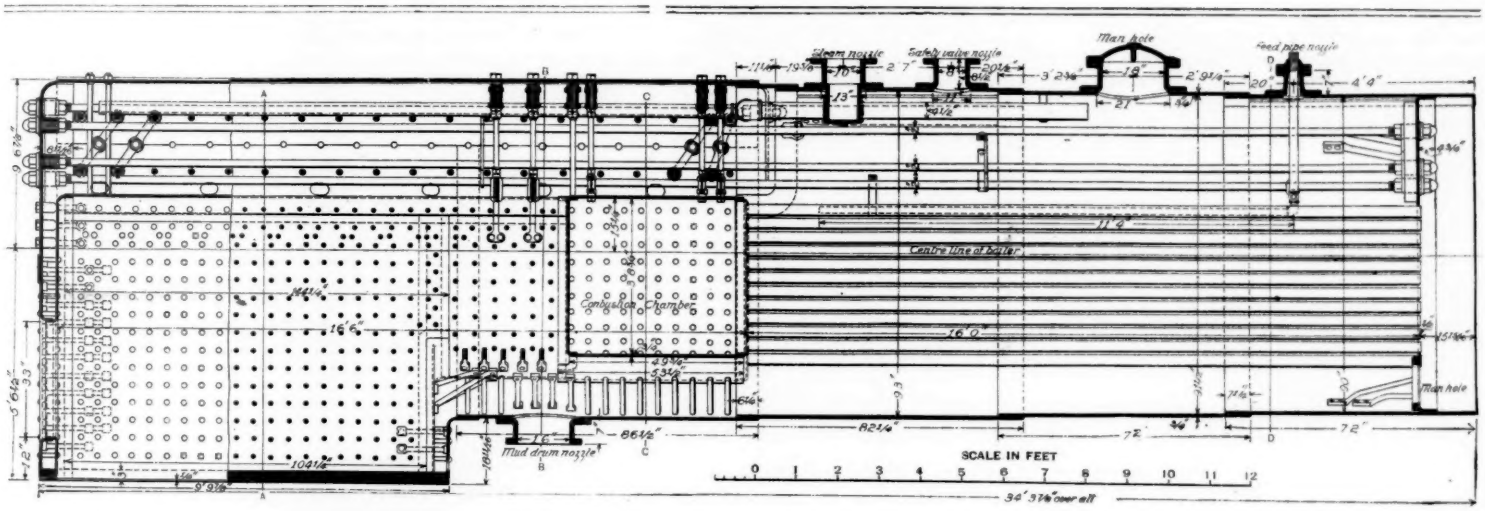
The hoisting system is the constant motion, non-reversing (as far as the engines are concerned) system, the drum rotating with the engine shaft when hoisting, and on the shaft when lowering. The cylinders, which are 18 in., 27¾ in. and 48 in., all by 7 ft. 6 in. stroke, are each provided with four gridiron valves worked by independent, positive, locked-motion, noiseless cams so made as to equalize the cut-offs. The high-pressure cylinder only is provided with an adjustable cut-off, ranging from 0 to ⅞ stroke. This is automatic, and is controlled by a very sensitive and powerful hydraulic governor actuated by a high-speed ball governor. Between the high-pressure and intermediate cylinders and the intermediate and low-pressure cylinders are reheating receivers. The low-pressure cylinder exhausts into a condenser. The air pump is horizontal and is worked by a crank on the end of the beam centre-pin. The beam is in two "flitches" keyed to a single centre-pin having adjustable journals in the bed plate. The high-pressure and intermediate links connect to overhung pins on opposite sides of the crank end of the beam, and the low-pressure link connects with a pin between the flitches at the other end of the beam.

All pistons have the same stroke of 7 ft. 6 in., and the crank pin describes a circle of that diameter.

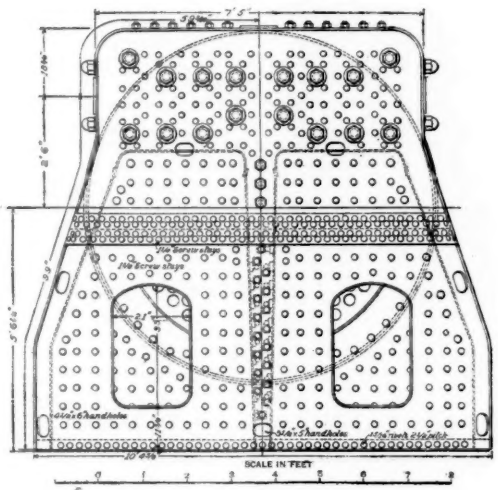
The advantage of this type of engine, which is patented, is that it is very low and long, thus giving great stability and reducing the height of the building, to say nothing of the small friction which is common to all beam engines. Although the stroke is 7 ft. 6 in., the links are only 5 ft. long, and the total height above the bottom of the bed plate is only 24 ft., while the connecting rod is 15 ft. long. An ingenious feature (and one of great value) of two of these engines is that they are so placed that the axes of their shafts are coincident, and that thus their crank pins can be coupled together with a drag link. This allows either shaft to be driven by either engine, which, if one engine is disabled, is a property of the greatest value.

The bearings of the main shafts are 22 in. × 40 in., and each shaft is 22½ in. diameter outside of the journals. The length of the shaft is about 29 ft., and there is a 7½ in. hole running its entire length. The shafts, cranks, pins, piston rods, cross-heads and links are made of the finest quality of Krupp crucible steel, and specimens of it sustained the most remarkable tests. The outboard pedestal of the shaft is provided with a ball and socket box. The fly wheel is 30 ft. in diameter, and is turned on the edges and circumference.

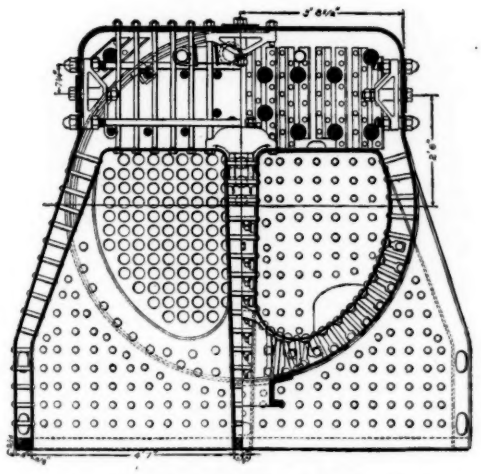
The hoisting drum is conical, being 27 ft. in diameter at one end and 14 ft. 7 in. at the other, and turned with a spiral groove to accommodate 5,500 ft. of 1⅝ in. wire rope, without superwinding. The engine, by means o



Longitudinal Section.

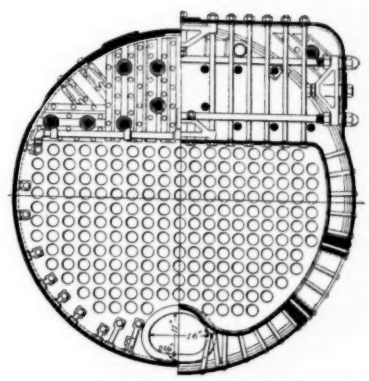


Front Elevation.



Section AA, Looking Back.

Section BB, Looking Forward.



Section DD, Looking Back.

Section CC, Looking Back.

90-INCH BELPAIRE FIREBOX BOILER FOR TRIPLE EXPANSION ENGINES.

FOR THE CALUMET & HECLA MINING CO.—DEAN & LEAVITT PATENT.

an automatic device, varies its speed from 30 to 45 revolutions per minute, thus hoisting at a uniform rate. The power is thus varied as more or less rope is to be hoisted. The capacity of the engines is to hoist 10 tons of rock at a speed of some 2,000 ft. a minute. At one end of the drum there are three wood-shod spaces as bearings for steel plate straps, one for the brake, one for the clutch and the other for what is known as the fleeting engine, which is nothing more nor less than a hydraulic barring engine.

The clutch strap is connected with the arms of the fly wheel, one end being fixed to the wheel, and the other to one arm of a bell crank working in bearings in an arm of the wheel. The other arm of the bell crank is connected by a link to a hydraulic plunger in the hub of the wheel, and water is introduced through the centre of the shaft to this plunger cylinder. Another smaller plunger loosens the clutch strap. The brake cylinders are similarly operated, but of course they are secured to a permanent stand. The fleeting engine strap is tightened by means of hydraulic cylinders fixed to the cross-head of the fleeting engine. When a "grip" is taken the main cylinder of the fleeting engine receives water at the end, which will cause motion in the desired direction. There are also sprinkling pipes for each of the straps and troughs underneath to carry off the waste water.

All of the levers are conveniently arranged for one operator. The drum operator can also manipulate the engine, and he has a convenient throttle lever and injection wheel for that purpose, independent of those used by the engineer proper.

The cylinders of the engines are sufficiently high to allow the jacket and receiver condensation to return to the boilers by gravity without the interposition of traps.

The pumps and accumulators are in a house within the main house. The engine house is 112 ft. long by 68 ft. wide, and is commanded by a 30-ton traveling crane, also designed by Mr. Leavitt. The floor of the engine house is of iron. The boiler house is 76 ft. by 68 ft.

The engines, drums, fly wheels and a portion of the hydraulic gear were built by the I. P. Morris Co., of Philadelphia; the fleeting engines, brake gear and iron floor by the Builders' Iron Foundry, of Providence, R. I.; the traveling crane by the Delamater Iron Works, New York; three of the boilers by the Dickson Manufacturing Co., of Scranton, Pa., and two of them by the I. P. Morris Co.

It should be added that each engine is provided with telltales, speed, drum, and crank indicators, etc., all of original design.

THE BOILERS.

The engravings show the type of boiler used for the above-described engines. They are five in number, and of the Belpaire type, 90 in. in diameter at the smoke box. They are made of Otis steel, possessing an elastic limit of 37,000 lbs. per sq. in. and an elongation of 20 per cent. in 15 in. The circular part of the shell is ⅜ in. thick, the outer fire box ⅜ in., and the inner fire box ⅝ in. The tube plates are ½ in. thick. If it were not for the high elastic limit of the steel it would be desirable to use it thicker in the barrel, as the working pressure is 185 lbs. per sq. in. They are the largest Belpaire boilers that have ever been built, and weigh 86,000 lbs., without the ash pit and supporting cradles.

There are two fire boxes terminating in so-called flues, which come together in a common combustion chamber. The fire boxes are separated by a water leg which extends to the combustion chamber, 4 in. wide at the bottom and 8 in. wide at the top. The side water legs are 4 in. wide at the bottom and 6½ in. at the top. The fire boxes are each 4 ft. 7 in. wide inside by 9 ft. long, but the last 18 in. are covered with fire brick. A brick arch, as in locomotive practice, extends from this wall toward the fire door, and there is a shovel-shaped deflector extending from the top of the door toward the brick arch. The upper part of each fire door is hinged backward, and the boilers are run with this part of the door partially open, in order to supply needed air above the coal. The efficiency of this arrangement has been proved in service.

The flues reaching from the fire boxes to the combustion chamber are 3 ft. 3 in. long, and the combustion chamber is 4 ft. 3 in. long. The tubes, of which there are 201, are 3 in. in outside diameter and 16 ft. long in the clear. The seven stays are in general 1¼ in. in diameter, and 5 in. apart.

The total length of the boilers is 34 ft. 3⅞ in.; width and height over all, respectively, 10 ft. 4⅝ in. and 9 ft. 6¾ in. They are set upon ash pits 21 in. high, making the total height 11 ft. 3¾ in.

The distinguishing feature of the design under notice is the passage way over the middle of the fire box, which permits close inspection of the crown sheets. This is made possible by the peculiar kind of bracing, both horizontal and vertical. The transverse rods are kept far enough apart to allow a passage way between them by connecting trusses between their ends, to which are stayed intermediate points of the side plates. The intermediate points of the outer and inner crown sheets are similarly stayed.

The steam is taken by dry pipes extending through the steam space close to the top of the boiler, in which are narrow slots so as to prevent steam from being drawn locally.

The feed pipe enters the top of the boiler and divides into two branches, which run some twelve feet along the sides of the boiler before discharging the water.

The blow-off is located at the point where experience has shown the greatest accumulation of mud, viz., just in front of the fire boxes.

The longitudinal joints of the circular parts of the shell are butted, and have both outside and inside welts, the latter much wider than the former. There are ten rows of rivets, those in the outer rows being widely spaced. The circumferential seams are triple riveted, lap joints.

The heating surface is made up as follows:

	sq. ft.
Fire boxes	322.0
Flues	83.4
Combustion chamber	103.0
Tubes	2,342.3
Back tube sheet	34.4
Total heating surface	2,985.0
Grate surface	68.75
Ratio grate to heating surface	1 to 42.1

These boilers have shown themselves capable of giving out one horse power for each four square feet of heating surface when driving a compound engine.

The Calumet & Hecla Mining Co. have in service and ordered 46 of these boilers, 19 of which carry 185 lbs. of steam and the remainder 135 lbs.

Chilled Wheels—Guarantee and Settlement.

We have received a copy of the minutes of the annual meeting of the Association of Manufacturers of Chilled Car Wheels, held last November. Much the greater part of the minutes is the report from the Joint Conference Committee, which, with the committees from the Master Car Builders' Association and Master Mechanics' Association, drew up specifications, guarantee and a method of settlement for chilled wheels. These were published in full in the *Railroad Gazette* last July, and are to be found in the last annual report of the Master Car Builders' Association. Therefore, it is not necessary to repeat them here. It will be remembered that the specifications were adopted

in October, on letter ballot, with 65 votes to spare; but the guarantee and basis of settlement was adopted by but 312 affirmative votes out of a total of 440, 294 being necessary to carry it. The specifications and guarantee are now the standard of the M. C. B. Association. The Wheel Makers' Association passed unanimously the following resolution:

That this Association accepts with satisfaction the action of the Railway Master Mechanics' and of the Master Car Builders' Associations, upon the report of the Joint Conference Committee on specifications and guarantees for chilled cast iron wheels, with the understanding expressed in the following preamble and resolutions:

Whereas, The wheelmaker has no control over the conditions of railroad service; and whereas, such conditions vary materially on different roads:

Resolved, 1. That in all mileage or time guarantees the wheelmaker ought to be held responsible only for wheels which fail through faults of material or workmanship.

2. That when wheels are taken out of service on account of sharp flanges, flat spots, comby or shelled-out treads, or for cracked brackets or plates, and it is found, on breaking up the wheels, that the depth and character of the chill, and the strength and character of the metal in the plates, are up to the standard specifications adopted by the Joint Conference Committee of the Railway Master Mechanics', the Master Car Builders' and the Wheel Makers' Associations, it shall be considered that the failure is due to the service and not to the quality of the wheels, and that the wheel maker ought not to be called upon in such cases to pay for or replace any such wheels.

The exceptions made by the Joint Committee are: (1) Wheels flat by sliding; (2) Chipped flange; (3) Broken flange if the breakage is not caused by seams, worn through chill or worn flange; (4) Broken or chipped rim not caused by rim being hollow; (5) Breakage of any kind caused by wreck or derailment.

Since writing a few weeks ago on the subject of guarantee, we have received several letters from wheel makers, portions of which are given below. First, however, we should explain that in what we said in our issue of Feb. 21 of the guarantee system we intended to restrict our approval to the *whole* plan as laid out by the Joint Committee and adopted by the M. C. B. Association.

One wheel maker writes:

"This whole idea of a guarantee is based on the expectation of procuring excellency of work by a money consideration. The foundation is defective, for in every department of life it is well known that the best work is done without much regard to pecuniary reward. The practical operation is also defective, for all makers give the same guarantee. The result is, price controls the purchase rather than excellency. The best material and the best skill cannot be furnished for any length of time at the same price as the poorest, but if the maker of the poorest is willing to make the same guarantee that is required of the best, the best must accept his price or else go out of business. Yet this has been the practical result of every system of guarantee that has yet been formulated.

"The specifications and guarantees adopted by the joint conference committee of railroadmen and wheel makers were carefully considered before being submitted to the associations represented in the committee. Now they have been acted upon by each association independently of the others, and are before the railroad public for acceptance and enforcement. A full discussion of their merits will now help all to reach a right conclusion. In this discussion the principles expressed by the resolutions of the wheel makers will be important elements and are worthy of careful consideration. [Resolutions printed above.]

"The specifications drawn up by the committee, if carried out, will undoubtedly give the railroad companies sufficient guarantee that the wheels they purchase are fairly safe. The guarantee, however, while perfectly just in its principles, will be very difficult to enforce, and will involve a system of accounts which many roads will probably find impracticable. Besides, *the conditions of service* will very often complicate the matter still further by introducing elements over which the wheel maker has no control, and about which great differences of opinion may exist.

"In view of these facts the wheel makers propose that their work shall be judged by the quality of their material and workmanship. It is a common experience that some wheels of every maker fail to meet the guarantee in time or mileage, and yet they are just as excellent in every respect as the great majority which far exceed the guarantee. The failure has been due to the manner in which they have been used. To condemn such wheels impeaches the character of the maker, for which no compensation for the extra service of his other wheels is any adequate return. The proposition, therefore, of the Wheel Makers' Association meets this difficulty, and suggests quality as the true guarantee. When a wheel fails let it be as rigidly examined as when first offered for service, and the cause of its failure fairly ascertained, and not assumed, as at present. Such an examination will not only reveal the character of the maker and of his work, but it will greatly improve the railroad service, by revealing where *it* is at fault, and suggesting the proper remedy. The result will be economy, and it will be obtained with less machinery than by any system of accounts.

"The principle involved in this proposition is the one which decides the market in most other matters of far less importance. No man expects to buy boots of the best quality at the same price that is asked for the poorest. Neither is it expected that the best will wear as long if worn over broken glass or hot slag as if worn in a parlor. Neither is it expected that an extra price should afterwards be paid for boots that wear longer than usual. Why should wheels be bought on any different principles from boots?"

This writer stands in the very front rank of wheel makers, and one would suppose that he, if any one, would be the gainer by a method of settlement which would pay for the actual service done by the wheels. We can understand his position, and agree with him so far as the old method of time or mileage guarantee goes, but under the new method the gain in getting paid for service actually rendered would probably far outweigh the disadvantages of guarantee. At least this seems to be the opinion of the majority of the best makers. The following letters are from three of them:

"We are very much pleased with the guarantee as proposed by the M. C. B. Committee of 1889, and which has since been adopted by letter ballot. We feel that it is a step of great importance to the wheel makers as well as to the railroads, and must in time be taken by them. We strongly advocate the inspection and test of wheels, and a guarantee to be given in addition. Makers of good wheels will all rejoice at the prospect of a time coming when they will be paid for their wheels in proportion to the service they give; that is, as their wheel, so the mileage and so the profit to them.

"In turn the railroads will find that they will get a safer wheel and one whose mileage cost to them will be less than when put in service with simply a time guarantee. There will be less accidents, less detention of cars, both of which must mean money to the railroads. By the old custom, and I am sorry to say the present one, some of the roads buy at the lowest price possible; not seeming to care as long as the wheel is guaranteed. This must in time be done away with. On the trial and adoption of the proposed system of paying so much per mile, which is simply for what they get, the wheel maker will receive pay for what he supplies and the railroads will find cost of wheel service to be greatly reduced. The railroads at the present time buy a wheel for so much money, guaranteed for such a length of time; guarantee being equal, the lowest bidder gets the order. The wheel is called upon to run a stated time. If it falls short a new wheel must be given in place of failure. If it runs over the time the railroads say nothing of excess of service. Now, it stands to reason that the wheel maker cannot afford to furnish a wheel that will run much in excess of its guarantee, and the price paid for the wheel being low, he cannot afford to make it from the same material that he would were the railroad to pay for the wheel during its life. Some wheels fail to make guaranteed mileage, some just pass the mark, and some run far in excess of guarantee. If railroads would figure up in this way what the cost of mileage has been to them (to say nothing of detention of cars), it would prove to be greater than though they were paying so much per 1,000 miles of service.

"You can readily see that a greater mileage of all wheels would very materially reduce the cost per 1,000 miles of service."

The letter which follows is not quite so sanguine as the last. Perhaps that is a matter of individual temperament. At least we are disposed to think that the writer takes too gloomy a view of the situation, and that the reform is much nearer than he suspects.

"I do not feel that I can add anything new in regard to the chilled wheel guarantee. It has made some progress, and is without doubt appreciated by a large number of master mechanics and master carbuilders, but to get the railroads to take hold of it through their purchasing agents is quite another matter. A running account with a wheelmaker, whereby he may by superior workmanship earn some extra compensation, is not looked upon apparently with favor, and the gain to the roads in the matter of increased safety is lost sight of in the desire to make a dollar go further than it should. However, we all feel that a movement has been made in the right direction, and if the master mechanics and the master carbuilders will only insist upon a few of their orders being placed in accordance with the guarantee, and care taken to preserve the results of such trials, especially in the matter of breakages, some of us may yet live to see the day when a large percentage of our product will be turned out on a basis of fair dealing such as the guarantee suggests."

We close with a very short extract from a letter from a veteran, who makes good wheels and has been unceasing in his efforts to raise the standard.

"The ground seems to have been so well covered that I cannot now suggest anything to add to what has been written on the subject. At present I do not feel like saying more. I feel grateful for the interest you have taken in this matter, and if officers of railroads who are more directly interested would take hold of the subject (and I believe they will) we can soon bring about a radical change which will be of great advantage to the railroad companies."

Annual Reports of State Railroad Commissions.

MICHIGAN.

The annual report of Mr. Rich, Railroad Commissioner of Michigan, is for the year ending Sept. 30, 1889. The review of results of operation and of the financial condition of the railroads of Michigan is for the year 1888, and therefore is hardly of sufficient present interest to warrant reproducing here. Certain comparative figures for four years are given as follows:

	1888.	1887.	1886.	1885.
Gross earnings per mile	$5,809	$6,575	$6,048	$5,797
Per train mile	1.117	1.105	1.344	1.249
Expenses per mile	4,003	4.216	3,958	4,661
Expenses per train mile	.861	.909	.880	.879
Per cent. of expenses to earnings	68.90	64.23	65.45	70.35

The Commissioner gives the provisions of the law of 1889 regulating passenger rates. Our readers will remember that under this law all companies whose passenger earnings amount to $3,000 per mile or over may charge but 2 cents per mile for passenger fares. Those which earn between $2,000 and $3,000 per mile may charge 2½ cents; those which earn less than $2,000 per mile may charge 3 cents. The law also requires that thousand-mile tickets at 2 cents a mile be kept on sale at all ticket offices. The law is being complied with by the roads operating under the general railroad law but not by those operating under special charters, except that the provision concerning thousand-mile tickets has not been complied with by any company so far as the Commissioner knows. In point of fact the average rates charged by the principal companies have been little more, and in one case have been less, than those contemplated by the law.

Concerning automatic couplers the Commissioner has nothing to say, further than that the question seems as far from settled as ever. The law requiring all engines to be equipped with driver and tender brakes is meeting with general compliance, and many of the live-stock trains are equipped with air brakes. Concerning heating, the Commissioner takes a very conservative position, and does not consider that any of the devices so far brought forward are worthy of his approval.

Trestles are being fast replaced by earth banks. During the year under consideration, 5,826 feet of trestle was replaced by earthwork, and 270 culverts were rebuilt, of which 28 were renewed in stone or iron and 33 with pipe.

The bridges on the Michigan railroads are reported as having a length of a little over 51 miles, averaging one span of 103 ft. for each 2½ miles of track. Full descriptive lists of all the bridge structures in the State have been furnished to the department, and it has been able to direct the attention of the proper officials to such as appear lacking in any essential of strength and safety.

Twenty-nine first-class and 11 second class interlocking machines have been put in during the season. The distinction made by the Commissioner between first and second class machines is not apparent. He says further that the law of 1889, authorizing the Commissioner to order interlocking put in at existing crossings, will result in the erection of a large number of plants during the season of 1890.

Concerning trespassers on trains and tracks the Commissioner says: "Owing to the want of wholesome legislation which should authorize the arrest of persons found trespassing on railroad properties, there is no abatement in the work of their taking off. One hundred and twenty three of that unfortunate class were run over last year and either killed or maimed for life, an increase of 15 upon the previous record."

In conclusion he says that the present condition of the railroads of the state is better than ever before. The service continues to improve, the laws are more closely observed than heretofore, and the relations between the railroads and the people are in a very satisfactory condition.

MAINE.

This is the thirty-first annual report, indicating that the board of railroad commissioners of the state is a venerable one, but it has until this year been of small importance for the reason that the appropriation was insufficient to admit of any work being done. For the year ending Sept. 30 last earnings have increased generally and at more than the ordinary rate. Nearly 200 miles of new road was completed, the principal line being the Canadian Pacific, which was completed June 1. The total mileage is now 1356. The reports of the different railroad companies are not summarized. The board has considered the heating and lighting of passenger cars, and discusses at length the collision at Boyds, on the Maine Central, March 23, 1889, in which two mail agents were burned to death. The approvals granted by the board of the use of individual heaters expire July 1, 1890. It is hoped that the experimental stage will have passed, and that continuous heating will be universally adopted in the near future. The board believes that the approval of the "Janney type" of coupler by the Master Car Builders' Association has tended more to hinder than to promote the general adoption of automatic couplers, but the later improvements are looked upon as warranting a more general adoption of the type now. Legislation by individual states on freight car couplers is deemed unwise. Employés should be stimulated to greater efficiency by a system of grading, with increased pay for length of experience. Accidents ought to be reported to the board more faithfully by the companies. Eighteen pages are given to brief notes of the physical condition of each of the roads of the state. Decisions of the board rendered during the year, chiefly on locations and crossings, are given in full. Among laws passed during 1889 are one requiring frogs and guard rails to be blocked for the protection of employés' feet, one providing a penalty for disorderly conduct on cars, and an act defining the

method of apportioning the cost of making under or over bridges for highways and of changing existing crossings. The decision is with the railroad commissioners, but is subject to appeal to the Supreme Judicial Court. The law reorganizing the board of railroad commissioners specifies that the chairman shall be a lawyer, that one shall be a civil engineer and one experienced in management and operation of railroads.

Gold's Interchangeable Steam Heating Coupling and Buchanan's Joints.

The steam coupling shown herewith is a combination of the Gold coupling in its latest form, with a metal ball and swivel joint connection, the latter the invention of Mr. W. Buchanan, Superintendent of Motive Power New York Central & Hudson River.

The Gold coupling has been quite extensively and successfully used on the Delaware, Lackawanna & Western and other roads, in connection with rubber hose. Careful experiments have demonstrated that it can be as successfully used with metal connections. It is claimed that with this coupling and the joints shown are secured perfectly steam-tight joints, automatic uncoupling as cars are drawn apart, and, what is of great importance, a saving of the expense which is now incurred for renewal of rubber hose, as the metal joints will last as long as the car, with but a trifling cost for repacking when necessary.

Fig. 1 shows a section of the ball joint. The coupling is connected with the joint by a short steam pipe, which screws into the thread at *A*, making a rigid connection between the ball joints when coupled up. The ball is inserted into a socket *B*, which has a vulcabeston packing ring at *C* to fit the exterior of the ball, and which is made in two parts as shown. Acting as followers are two packing rings at *D*, which are split to allow them to expand around the ball, and thus follow up the packing rings as the large follower *E* is forced inward by the threaded nut *F*. This latter is prevented from slacking in service by the lock nut *G*. The ball joint is by this construction adjustable, and capable of considerable lateral movement, because of the wide opening in the nut *F* at its mouth *H*, and it provides for all angular movement of the metallic coupling.

To provide a movement longitudinal with the car the swivel joint shown in fig. 2 is used. This is placed about 13 in. to one side of the ball joint, and is vertical. The end *J* of the swivel joint is connected with the ball joint. The end *I* is connected rigidly with the train pipe, at right angles with it. Therefore, as the coupling swings forward and backward, motion is provided for in this steam-tight swivel joint. The part *I* is connected to *J* by a screw thread at *K*, and on this thread rotation takes place. The packing rings, the follower and the follower nut are made to operate in the usual manner and prevent any leaking.

Fig. 3 shows a horizontal section of the Gold coupling. Both parts are exactly alike and interchangeable, and are made of malleable iron. The joint is made by the faces of the steel disks *D* being brought together, the couplings being held in a horizontal position when the adjustable lug *A* engages with the inclined plane at the back of each coupling body, and slides around it as the coupling is allowed to drop, bringing both faces square together, and forming a perfect joint, on the principle of a gravity lock. As cars are pulled apart, and the couplings are drawn to a horizontal position again, they uncouple automatically. The adjustable lug *A* working in the pin *B* acts as a compensating piece in case there should be any defect in the disk or the inclined plane, and the set screw *C* can be used to take up any wear.

In fig. 4 is shown a vertical section of the automatic relief trap which is fitted into each coupling body for the purpose of discharging all water of condensation and preventing freezing. When steam pressure is on, the trap is tightly closed, a joint being made by a composition disk in the valve stem, and no steam can escape; but immediately steam is turned off a spring lifts this valve seat and opens the trap, when the water runs off as it collects, this being the lowest point of the apparatus. The joints and pipes, being relieved in this way, can never freeze.

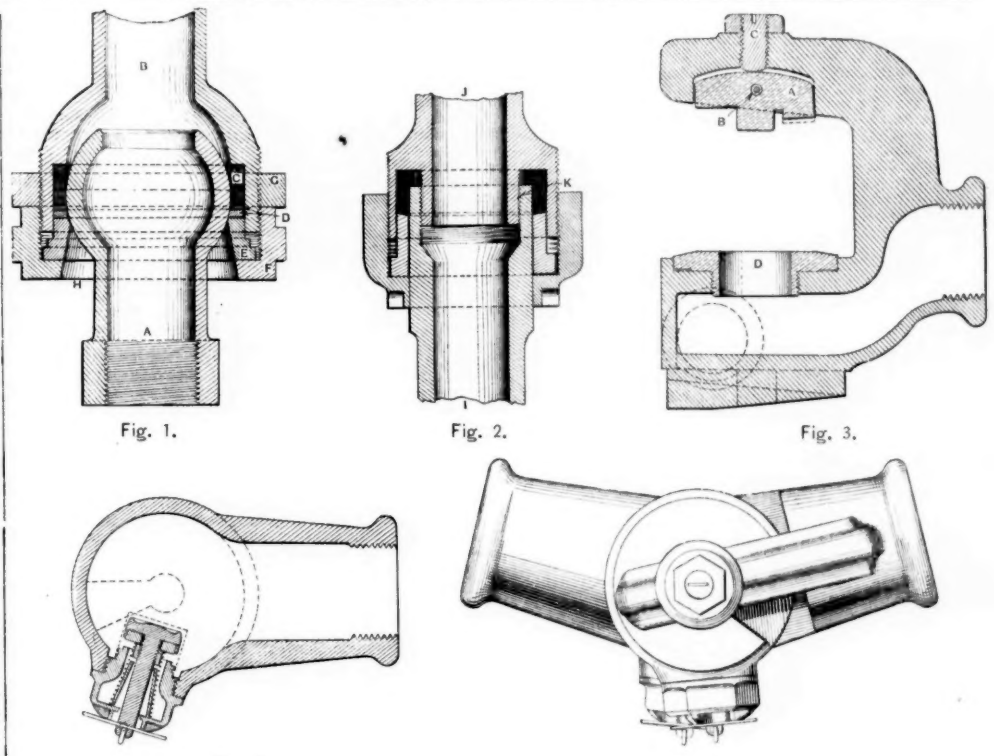


Fig. 1. Fig. 2. Fig. 3.

Fig. 4. Fig. 5.

STEAM HEATING COUPLINGS AND BALL AND SWIVEL JOINTS,
AS DESIGNED FOR METALLIC CONNECTIONS.

In fig. 5 the couplings are shown as coupled and ready for use.

Boston & Albany Platform Gate for Passenger Cars.

The platform gate shown herewith has recently been adopted by the Boston & Albany for all of its passenger train cars. It was invented by an old employé of the company, Mr. Frank Smith. Its construction is clearly shown by the accompanying cuts, which show the gate in position protecting the platform in figs. 1, 2 and 3. In fig. 2 it is also shown fastened back to a fully open position. It will be noticed that the gate is mounted on a shaft passing vertically through its centre at *A*, and not by a hinge at its side. The gate is supported by the swinging brackets, *B B*, attached to this vertical shaft. As it is opened or shut the regulating lever, *C*, controls its position in such a manner that when the gate is fully open it is parallel with the end of the car, as shown in fig. 2, and when fully shut it is paraliel with the side of the car and closes up the platform as shown in fig. 3. When the gate is open or shut, the handle, *D*, acts as a gravity lock and holds it in the desired position. It will be observed by an inspection of fig. 3 that the gate, when closed, is not fastened at its outer end, the combined action of arms *B* and *C* holding it rigidly in position. This gate has been adopted for its simplicity, compactness and the readiness with which it can be handled. Boston & Albany mail cars, which are run on trains where the mail men have to go from one car to another frequently, are equipped with a sheet-iron gate made on this plan, and extending from the floor to the roof, so as to exclude wind and rain.

The Bay View Collision.

The coroner's jury has continued its sessions at Buffalo, but has elicited no very important testimony since our last issue. The conductor's valve in the rear car of the forward portion of the train was *not* equipped with a cord running through the car. A clear-headed passenger, Mr. Minnick, testified that the conductor and other trainmen, baggage agents, etc., to the number of six in all, gathered in the corner of the car near the valve, but there is no evidence that any one of these pulled it. The engineer testifies that he heard the gong ring once, and then, after an interval, heard it once again. While he was going from the front to the rear of the cab to speak to the fireman the train was stopped by the brake going full on, but *he did not apply it*. It appears that there was an interval of from one to five minutes between the parting of the bell rope and the collision.

The jury, after about five hours' deliberation, returned a verdict which is reported as follows:

That the said John T. Power, J. W. Flynn, E. E. Stewart, Mrs. E. E. Stewart, Mrs. Emma Baucus and John Swan came to their deaths on the sixth day of March, 1890, about 9 o'clock p. m., from a collision of passenger train No. 12, on the Lake Shore & Michigan Southern railroad tracks, near Bay View station, said train consisting of 11 cars, which broke in two, the forward end stopping and the rear five cars crashing into it; that, after a careful, earnest and thorough investigation, we, the jurors, further find that the management of the Lake Shore & Michigan Southern Railway Co. should be charged with gross negligence, for the reason that the rules and regulations for the running of their trains are not strictly enforced, and that the safety of passengers is endangered thereby; that passenger trains of such length should not be run upon this or any other railroad with only two trainmen; and this jury has reason to believe that Division Superintendent Charles B. Couch has knowledge that passenger trains have been run on said road in an unsafe and crippled condition, and that if he had exacted a rigid enforcement of their rules and regulations this accident could not have happened.

And this jury does not think that it was proper that the wreck or any portion of it should have been removed or destroyed until after an investigation by the coroner's jury, further than the clearing of the tracks for the movement of trains. And that the conductor, John W. Houghtaling, is personally responsible for the accident, for these reasons:

1. For leaving Dunkirk with the air brakes on the rear five cars crippled, when it was within his power to make

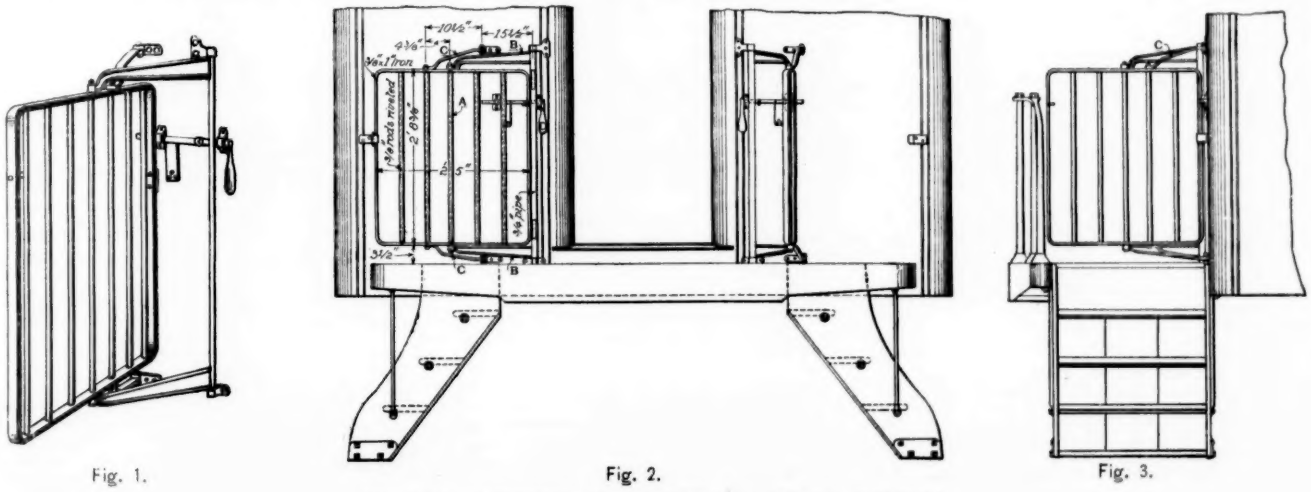


Fig. 1. Fig. 2. Fig. 3.

STANDARD PLATFORM GATE—BOSTON & ALBANY RAILROAD.

the proper connections of air brakes with but a few moments delay.

2. For not having the safety chains properly adjusted between the rear day coach and the sleeper "Salina" after the break at Dunkirk.

3. For not properly placing his trainmen upon the cars when the train had parted at Dunkirk, to protect his train in case of a second parting.

4. That at the time of his notification and his own knowledge that the train had parted, at or near West Hamburg, and for a second time, and in direct violation of the rules and regulations of the company, he pulled the bell-cord with the intention of stopping the forward portion of the train; and for the foregoing reason we hold the said John W. Houghtaling culpably negligent.

That Daniel D. Beckwith, the brakeman on the front portion of the train, is hereby censured for leaving the train without first notifying the passengers that the train had parted and that there was danger.

That the air-brakes that stopped the first portion of the parted train at or near Bay View were set by some person, or persons, to this jury wholly unknown.

In the absence of all evidence, and even of theory, regarding the responsibility for applying the brake, and as the jury seems to have taken no evidence regarding the faults in the coupler and in the safety chain, further comment must be postponed. The recommendations of the verdict are in general good, but the condemnation of both Couch and Beckwith should be supported by explicit evidence. The latter should *naturally* have turned his first attention to keeping the train moving; whethe a reasonably quick-witted person would have seen the necessity of first alarming the passengers has not been shown by any of the evidence thus far published. Whether Mr. Couch was in the habit of "exacting rigid enforcement" of rules or not, can be stated positively only after a good deal of inquiry into his official conduct, which apparently has not been made. Conductor Houghtaling had three ways in which to provide against the collision, as indicated in the first three points laid down in the verdict. It is necessary to leave to conductors' judgment which safeguard to adopt when two or more are to be chosen from, and the question of Mr. Couch's responsibility hinges on the way in which he has censured, counseled or instructed conductors when they have made such choices heretofore.

Mr. Couch, in his testimony, said that if he had been on the relief train the reporters would have been carried, and there would have been no complaint of suppression of information. This, of course, does not satisfy the public. Evidently all conductors and station agents need to be thoroughly posted as to the best way of properly meeting the demands of sympathizers and legitimate news-gatherers on such occasions, while, at the same time, firmly repressing idle sightseers.

Conductor Houghtaling has been arrested and bound over in $500 bail to await the action of the Grand Jury. He is charged with misdemeanor, for which the greatest penalty is one year's imprisonment and $500 fine. Apparently he might fairly have been charged with manslaughter in the second degree, for which the maximum punishment is 15 years' imprisonment and $1,000 fine. Engineer Mooney has been discharged, but the reports do not give the nature of his negligence.

Train Accidents in February.

COLLISIONS.

REAR.

1st, on Norfolk & Western, at Big Spring, Va., a freight train standing at the station was run into at the rear by a following freight which was not properly controlled. Engine and 12 cars wrecked. Two trainmen asleep in the caboose were killed.

2d, on Pittsburgh, Cincinnati & St. Louis, at McDonald's, Pa., freight train ran into the rear of a preceding freight wrecking caboose and several cars.

3d, 2 a. m., on Illinois Central, at Peotone, Ill., freight train ran into the rear of a preceding cattle train during a dense fog. The caboose was burned, and five stock drovers were injured.

4th, on Central of Georgia, near Fort Valley, Ga., a freight train broke in two and the rear portion afterwards ran into the forward one derailing one car.

6th, night, on Chesapeake & Ohio, near Hinton, W. Va., east bound freight train No. 72 ran over a misplaced switch and into a work train engine standing on the side track. The telegraph office building was overturned and thrown into the river. Two employes and a stranger who were in the building were drowned.

6th, on the Buffalo, Rochester & Pittsburgh, near Forestville, N. Y., a construction train moving backwards ran into the rear of a freight train which had stopped to leave some cars at a siding. Two employes were injured.

7th, on the St. Louis, Iron Mountain & Southern at Dermot, Ark., a freight train ran into a carload of rails which had been negligently left standing on the main track in the dark without a signal. The wreck was a bad one and three men were killed.

8th, on the Pennsylvania near Kittanning Point, Pa., freight train ran into the rear of a preceding freight, wrecking a number of carloads of hogs.

9th, on the Northern Central at Marsh Run, Pa., passenger train ran over a misplaced switch and into the rear of a freight, making a very bad wreck, which blocked the road all day. The fireman of the passenger train was killed, and four trainmen were injured. Two freight trains were to enter a long siding to clear the track for the passenger; the first one left the switch set for the siding, expecting the second to follow closely, but the latter train entered at another switch, and thus this one was left unattended.

10th, on Louisville & Nashville, at South Nashville, Tenn., south bound passenger train No. 3 which had stopped in the yard to allow another train to pass, was run into at the rear by train No. 5, damaging the rear car which was the private car of Vice Pesident Smith. There was a dense fog at the time.

10th, on the Chicago & Grand Trunk at Durand, Mich., passenger train struck the caboose of a freight train which was on the side track, but not clear of the main track, badly damaging a number of cars. One brakeman injured.

10th, on Columbia & Puget Sound near Black River Junction, Wash., coal train descending a grade broke in two and rear portion ran into the forward one wrecking a number of cars.

11th, on Pennsylvania, at Altoona, Pa., an east bound freight train waiting on the main track for a chance to enter the yard was run into at the rear by a coal train containing 50 cars, wrecking 12 cars of the freight. Many of the cars contained glassware which was broken to pieces. The road was blocked for nine hours. The engineer of the coal train, when he perceived his inability to control the train, blew his whistle loudly and three engines in the yard ran up past the standing train to a cross-over and placed themselves on the east bound track intending to break the force of the collision, or to slacken the speed of the coal train, but their efforts were unavailing. The three engines were pushed along over the track, with the freight, a considerable distance. One engineer was injured by jumping.

11th, on East Tennessee, Virginia & Georgia, near Dalton, Ga., freight train broke in two and the rear portion ran into the forward one, wrecking engine and a number of cars. Two of the latter were burned up and the engineer was injured.

13th, on Chicago, Santa Fe & California, near Carrollton, Mo., a freight train broke in two and the rear portion ran into the forward one, wrecking four refrigerator and two oil-tank cars.

13th, 1 a. m., on Central of Georgia, near Toombsboro, Ga., freight train ascending a grade broke into three parts and the rear portion ran back into a following passenger train, wrecking four cars.

16th, on Detroit, Lansing & Northern, at Stanton Junction, Mich., 23 cars broke loose from the rear of a freight train ascending a grade and ran back at high speed into a freight train standing in the yard at Ionia. The cars were wrecked and one brakeman injured.

14th, on Wisconsin Central, at Marengo, Wis., a passenger train standing at the station was run into at the rear by a platform car loaded with logs which had escaped the control of men some distance up the grade. The wreck at once took fire, the flames originating, it is said, in the lamps. Five passengers injured.

15th, on the Boston & Maine, at Ware, Mass., a west bound extra freight ran over a misplaced switch and into a mixed train standing on the siding, wrecking engine, caboose, baggage and passenger cars. A carload of vitriol was also wrecked and set fire to the three cars.

15th, on the Cincinnati, New Orleans & Texas Pacific at Melville, Tenn., freight train ran into the rear of a preceding freight, wrecking 20 cars. The flagman was negligent. Engineer and brakeman killed, fireman injured.

18th, on Louisville & Nashville at Phelans, Ala., freight train ran into the rear of a preceding freight, wrecking several cars.

19th, on Ohio River road near Blennerhassett, W. Va., freight train broke in two and the rear portion afterwards ran into the front one, wrecking three cars.

19th, on New York Central & Hudson River at Rome, N. Y., an east-bound freight ran into a switching freight, derailing five cars.

21st, on the Central Vermont near Chester, Vt., a mixed train broke in two, and the rear portion ran into the forward one, causing a bad wreck.

21st, 4 A. M., on New York, Lake Erie & Western, at Addison, N. Y., freight train ran into the caboose of another freight train, causing it to take fire and burn up.

21st, on Southern Pacific near Suisun, Cal., a train of eight locomotives returning from a snow bucking expedition, broke in two between the fourth and fifth engines and the rear portion afterwards ran into the forward one injuring a number of laborers.

23d, on Cincinnati, Hamilton & Dayton, at Morristown, Ind., freight train broke in two and the detached portions collided, doing some damage.

24th, on Louisville, New Albany & Chicago, at Pleasant Ridge, Ind., freight train ran into the rear of a train of empty sleeping cars doing slight damage. There was a dense fog at the time.

25th, on the Boston & Maine at Winter Hill, Mass., a local passenger train ran into the rear of the Montreal express, derailing one car of the latter and slightly injuring several passengers. There was a dense fog at the time; both trains were running slowly, but the engineer of the local, on finding the Union automatic electric signal at danger, assumed that it had been so set by his own engine and that he had failed to see the movement by reason of the fog, whereas it in fact indicated the presence of the Montreal train in the section ahead.

26th, 1 a. m., on Central of New Jersey, at Plainfield, N. J., an empty coal train ran into the rear of a preceding train standing at the station. Several cars were wrecked and two trainmen were injured. There was a dense fog at the time.

26th, on Michigan Central, near Kalamazoo, Mich., a freight train broke in two and the two portions collided, wrecking 13 cars.

26th, on Western of Alabama, at Notasulga, Ala., a standing freight was run into at the rear by another freight, wrecking engine, caboose and six cars. Engineer injured.

27th, on Cleveland, Cincinnati, Chicago & St. Louis, near Indianapolis, Ind., a passenger train ran into the rear of a freight train in a dense fog, disabling the engine and damaging the caboose and several cars. Fireman injured.

27th, evening, on Pennsylvania road, at Newark, N. J., a Lehigh Valley eastbound passenger train was run into at the rear by the Chicago limited express, just as the former started from the station. The foremost train was just entering the Centre street branch, and the other, which does not stop at Newark, was to proceed on the main line. The collision blocked the tracks for an hour, but the damage appears not to have been great. The accounts say that the engineer of the express miscalculated the distance.

27th, on Chicago, Milwaukee & St Paul, at Salt Creek, Ill., a fast freight train ran into the rear of another freight, wrecking an engine and 15 cars. Fireman and two tramps injured. An operator at a preceding station failed to hold the freight

28th, on Toledo, Ann Arbor & Michigan, near Ithaca, Mich., a disabled freight train was run into at the rear by another freight, wrecking engine and 12 cars. Conductor killed, three other trainmen injured.

BUTTING.

1st, on Texas and Pacific, at Gordon, Tex., freight train running 20 miles an hour ran over a misplaced switch and into an engine standing on the side track. Both engines and several cars wrecked; engineer injured by jumping.

4th, 6 a. m. on New Orleans & North Eastern, at Barnett, Miss., butting collision between passenger train No. 1 and freight train No. 16. The freight was stopped on account of a broken coupling and a man went forward to flag the passenger train, but he failed to stop it. There was a dense fog at the time. The engine and two cars were wrecked and two trainmen were injured.

7th, on Pittsburgh, McKeesport & Youghiogheny, near Homestead, Pa., butting collision between a work train and a freight on a high trestle, wrecking one engine and several cars.

7th, on Lehigh Valley at Barry's Junction, Pa., butting collision between gravel trains, killing one trainman and injuring another.

12th, on the Atchison, Topeka & Santa Fe at Albuquerque, N. M., passenger train No. 1 entering the yard five hours late at high speed ran over a misplaced switch and into a freight train on the side track, wrecking both engines and a number of freight cars. Engineer of passenger train killed.

12th, on Alabama Great Southern, near Coaling, Ala., butting collision between second section of passenger train No. 1 south bound with passenger train No. 10, badly damaging both engines and baggage cars. The southbound train was eight hours late, and had 12 Pullman cars filled with excursionists. One engineer was killed and 13 passengers were injured. The conductor and engineer of the south bound train were negligently running on the time of the north bound train.

13th, on Illinois Central, near Kankakee, Ill., butting collision between two freight trains. Engineer injured.

13th, 9 p. m., on Lake Shore & Michigan Southern at Bellevue, O., passenger train running 30 miles an hour ran over a misplaced switch and into a locomotive on the side track, wrecking both engines. The fireman who left the switch wrong and the other firemen were killed, and two trainmen were injured.

14th, 10 a. m., on Louisville, New Albany & Chicago, near Mitchell, Ind., butting collision between a northbound passenger and a freight train. One engineer, one fireman, and mail agent killed, and three trainmen and five passengers injured. The freight was wrongfully running on the passenger train's time.

14th, on Baltimore & Ohio, near Bairdstown, O., butting collision between east-bound freight No. 88 and west-bound freight No. 37, wrecking 24 cars, 12 of them being loaded with hogs and sheep. Two brakemen and a boy riding on the engine were killed. One of the trains had orders to wait at Bairdstown, but the orders were forgotten or misread.

15th, on Chicago, Burlington & Quincy, near Eubanks, Ill., butting collision between a freight and a construction train at a curve, wrecking the forward portion of both.

15th, on Norfolk & Western, near Saltville, Va., butting collision between freight trains, wrecking 14 cars.

15th, on Baltimore & Ohio, near Farmington, W. Va., butting collision between passenger train No. 71 and an east bound freight, wrecking both locomotives, baggage car and several freight cars. The wreck took fire but the flames were soon extinguished. Baggagemaster killed.

20th, 6 a. m., on the New York Central & Hudson River, near Lockport, N. Y., butting collision between freight trains, wrecking engines and five cars. The train that had the right to the road failed to give the proper whistle signals for a following section, and the inferior train proceeded in ignorance of the fact that signals had been carried. It was dark and stormy and the signal lamps on the front of the engine had gone out.

20th, on Savannah, Griffin & North Alabama, at Carrolton, Ga., a freight train approaching the station ran into the head of a freight train standing on the main track in the yard, doing considerable damage.

25th, on Lake Erie & Western, at Hilton, Ill., butting collision between two freight trains, making a very bad wreck. One trainman killed and another injured. A train dispatcher's mistake is given as the cause.

25th, on Lake Erie & Western, near Peoria, Ill., butting collision between two freight trains. Both engines and four cars wrecked. One brakeman killed and another injured. A dispatcher's mistake is said to have been the cause.

25th, on Western of Alabama, near Opelika, Ala., butting collision between a freight train and a construction train, wrecking the forward portions of both. Two trainmen injured.

25th, on Georgia Pacific, at Coalburg, Ala., butting collision between a freight train and a standing engine at a curve. Both engines disabled.

26th, on Baltimore & Ohio, near Parkersburg, W. Va., butting collision between two freights, doing considerable damage. Two tramps injured. The accident is said to have been caused by one of the trains starting out 10 minutes ahead of time.

CROSSING AND MISCELLANEOUS.

4th, on New York, Lake Erie & Western at Jersey City, N. J., collision between yard engines, injuring one of the engineers.

10th, at the crossing in Marshalltown, Ia., a Chicago, St. Paul & Kansas City freight ran into an Iowa Central freight. Engine disabled and several cars damaged.

12th, on Southern Pacific at Placerville, Cal., engine of a construction train returning from dinner became uncontrollable and collided with the caboose at high speed, badly wrecking both. Three employes killed.

22d, on Atlantic & Danville near Pleasantville, Va., collision between a passenger train and a wrecking train, killing a workman and injuring four train men, and nine other workmen.

25th, on Old Colony, near Chickering station, Boston, Mass., a north bound passenger train ran into the cars of a freight train, which was using a cross-over track on the passenger train's time. Three passenger cars were overturned and wrecked; four passengers were injured.

25th, on Pittsburgh & Western, at Wildwood, Pa., passenger train ran into a freight entering a siding, wrecking three box cars.

25th, on Union Pacific, at Portland, Or., switching passenger train backed into some freight cars, damaging the rear sleeper.

27th, on St. Louis, Iron Mountain & Southern, at Cabot, Ark., a passenger train ran into the side of a freight train entering a siding, derailing two box cars. Brakeman injured. A dense fog prevailed at the time.

DERAILMENTS.

DEFECTS OF ROAD.

2nd, 7 a. m. on Union Pacific, 1½ miles west of Cascade Locks, Or., tender and caboose of a work train broke through the high trestle over Williams Creek, both falling 70 ft. into the ravine below. In the car were 30 or 40 section men and trainmen going to clear away a land-slide which had blocked the road for two days. Nine of the men were killed, and 12 others in-

jured. The bridge had been undermined by a freshet. The engineer saved the locomotive by suddenly putting on steam as soon as he noticed the settling of the caboose.

2nd, on Missouri Pacific, at Scott, Mo., several cars of a freight train passing the station were thrown upon a side track at a defective switch, wrecking a number of them.

3rd, 7 p. m., on Peoria & Pekin Union, near Peoria, Ill., the first span of the bridge over the Illinois River gave way under an east-bound Ohio, Indiana & Western freight train, precipitating the engine, tender and five cars into the river and killing three train men. The fireman and the brakeman were buried under the engine in eight feet of water, and the engineer was pinned in the cab with his head just above the water. The engineer was standing on the dead body of the fireman, but fastened in such a way that he could not be extricated. The passengers and others worked three hours trying to get him out, applying hot water to keep him from chilling to death, and pouring brandy down his throat. The surgeons would have cut his leg off, but could not get at it, and he died of cold and exposure before he could be released.

11th, on Wisconsin Central, near Mellen Junction, Wis., passenger train derailed by spreading of rails, three cars being overturned. Six passengers were injured.

12th, on the Atchison, Topeka & Santa Fe at Edgerton, Col., stock train derailed by broken rail; fireman injured by jumping.

17th, on Gulf, Colorado & Santa Fe, near Green, Kan., engine, baggage car and passenger car went through a trestle bridge and down into a creek, killing a roadmaster and injuring two trainmen and several passengers. The supports of the bridge had been burnt away during the night.

19th, on Southern Pacific, at Cape Point Mills, Cal., five locomotives pushing a snow plow were derailed by a broken rail, three of them being thrown down a 50-ft. embankment. A brakeman was killed and three trainmen were injured.

20th, on the Western & Atlantic, near Atlantic, Ga., an engine was derailed at a defective switch.

21st, 4 a.m., on Union Pacific, at Harpers, Wyo., freight train derailed by broken rail; two cabooses and one car were overturned and burned up. Conductor and brakeman injured.

25th, on Evansville & Terre Haute, near Vincennes, Ind., the engine and baggage car of a passenger train went down into a creek, the bridge over which had been carried away by the swollen stream. Engineer and fireman killed; conductor and two passengers injured.

26th, on Union Pacific, at Piedmont, Wyo., forward engine of double-header passenger train derailed by a defective switch. Engineer and fireman injured.

28th, on Louisville, New Albany & Chicago, at Putnamville, Ind., passenger train derailed by a broken switch-rod

28th, on Utah Central, near Oasis, Utah, a passenger train was thrown from the track by a broken rail.

DEFECTS OF EQUIPMENT.

3rd, on the Pennsylvania at South Tullytown, Pa., a car in a freight train broke down, wrecking a number of others and blocking the road for several hours.

12th, on Pennsylvania, at Falmouth, Pa., 8 cars of a freight train derailed by the breaking of an axle.

14th, on New York, New Haven & Hartford near Berlin, Conn., freight train derailed by the breaking of an axle. One brakeman killed.

14th, on Union Pacific near Odessa, Kan., freight train derailed by a loose tire.

17th, on Milwaukee & Northern, near Grafton, Wis., 12 cars of a freight train were derailed by a broken truck, a number of them being badly damaged.

24th, 5 a. m., on the Pennsylvania road at Rosemont, Pa., eight cars of a coal train derailed by a broken axle and badly wrecked. One brakeman injured.

28th, on Richmond & Danville, near Toccoa, Ga., nine cars loaded with coal and pig iron were derailed by a broken wheel and went over a high embankment.

NEGLIGENCE IN OPERATING.

10th, on the Marietta & North Georgia, near Marietta, Ga., a portion of a passenger train passing a switch was thrown upon the side track overturning two cars. The switch was not properly fastened. Three trainmen injured.

11th, 2 a. m., on the New York, New Haven & Hartford, at South Norwalk, Conn., an east-bound freight ran past the distant signal, over a derailing switch, and on to the ground, just before reaching the draw bridge. The train was running 15 miles an hour and three cars were wrecked.

15th, on Colorado Midland, near Cascade, Col., a freight train which had become uncontrollable in descending a steep grade by reason of the air brakes being inoperative, was derailed at a curve and hurled against the side of a mountain, wrecking the engine and 16 cars. Several trainmen injured.

UNFORESEEN OBSTRUCTIONS.

6th, on Baltimore & Ohio, near Ohio Pyle, Pa., engine and three cars of a passenger train derailed by snow. Three trainmen injured.

16th, on Southern Pacific, near Saugus, Cal., passenger train ran into a washout, two engines and a mail car going into the ditch.

16th, night, on Lehigh Valley, near Fultonville, Pa., engine of passenger train derailed by rails placed across the track by some miscreant.

19th, on New York, Lake Erie & Western, near Waverly, N. Y., engine and several cars of a Lehigh Valley freight train derailed by a purposely misplaced switch.

22d, on Jeffersonville, Madison & Indianapolis, at Clifford, Ind., a freight train ran over a cow and a dozen cars were derailed and wrecked. Three trainmen injured.

24th, on Ohio, Indiana & Western, near Ludlow Falls, O., freight train wrecked at a washout, injuring a number of trainmen.

26th, on New York & Massachusetts, at Pine Plains, N. Y., car of passenger train derailed by a man who fell underneath it in attempting to board the train.

27th, on Chesapeake & Ohio, near Quinnimont, W. Va., a freight train ran into a landslide which had covered the track immediately in front of it, wrecking nearly the entire train.

28th, on Central Pacific, at Tehama, Cal., switching freight train moving backwards ran over a cow, derailing three cars.

28th, on San Antonio & Aransas Pass, near Hallettsville, Tex., passenger train derailed by pieces of stone and iron placed of the track by unknown miscreants. Engineer and fireman injured. It is stated that two previous attempts at train wrecking had occurred near the same point within a month.

UNEXPLAINED.

1st, on Chicago & Alton at Alma, Mo., freight train derailed; three trainmen slightly injured.

7th, on Wisconsin Central, near Ogema, Wis., 15 cars of a freight derailed and ditched.

8th, 11 p. m., on Norfolk & Western, near Glade Springs, Va., west bound passenger train No. 3 derailed. All the vehicles behind the engine left the track and went over an embankment. The engine was a new ten-wheel Rogers and had made only a few trips. The cause of the derailment is obscure, but the front driving wheels, which have plain tires, seem to have been the first to leave the track. The express messenger was killed, and five trainmen and five passengers were injured. The cars were heated by Baker heaters but no fire broke out.

8th, on Baltimore & Ohio, at Baltimore, Md., an engine ran off a coal trestle killing the engineer and injuring two other employés.

8th, on Blue Ridge & Atlantic, near Belton, S. C., freight train derailed, the caboose and five cars being thrown over an embankment.

9th, 11 p. m., on Norfolk & Western, at Pembroke, Va., engine and four cars of a freight train derailed and thrown down a bank into the river; brakeman and fireman killed, engineer injured. The engine exploded after it was overturned.

11th, on Boston & Maine, at Biddeford, Me., engine of freight train derailed.

12th, on the Lackawanna & South Western, near Richburg, N. Y., six driving wheels of the engine of a mixed train ran off the track on a trestle. The passenger car of the same train was also derailed and partially overturned.

15th, on Canadian Pacific, near Greenville, Me., freight train derailed, a number of cars being badly wrecked.

17th, night, on Boston & Albany, at East Brookfield, Mass., freight train derailed.

18th, night, on Norfolk & Western, at ——, a car of lumber in a freight train jumped the track and derailed three other cars and the engine, which went over a bank into the river. The engineer and a man riding on the engine were killed.

19th, on Chicago, Santa Fe & California, near Fort Madison, Ia., two cars of silver bullion in a freight train derailed and wrecked.

20th, Pittsburgh & Western, at Harmony, Pa., a car in a freight train was derailed and knocked down the supports of an overhead bridge, wrecking the bridge and several cars.

20th, on Philadelphia & Atlantic City, at Pomona, N. J., engine and seven cars of a work train derailed.

21st, on Maine Central, near Fairfield, Me., freight train derailed at a switch.

21st, on the Boston & Maine, at Gilbertville, Mass., eight cars of a freight train derailed and badly wrecked.

22d, on Atlantic & Danville, at Edgerton, Va., caboose and three cars of freight train derailed and wrecked. The caboose took fire and was destroyed. Conductor injured.

25th, on Central Pacific, at Penryn, Cal., 5 cars of freight train derailed and damaged.

25th, on Pittsburgh & Western, at Tombell, Pa., car of freight train derailed.

26th, on Chicago, Milwaukee & St. Paul, near Birmingham, Mo., engine and 7 cars of freight train derailed and wrecked. Brakeman injured.

26th, on Norfolk & Western, near Roanoke, Va., car of passenger train derailed at a switch and overturned, injuring 11 passengers.

27th, on Pittsburgh & Western, at Allegheny City, Pa., several cars of freight train derailed and wrecked. Brakeman killed.

OTHER ACCIDENTS.

4th, on Central of Georgia, near Griffin, Ga., spring hanger of locomotive broke, detaining the train three hours.

5th, on Evansville & Terre Haute, near Evansville, Ind., engine of a passenger train had its boiler torn open by a broken side rod. The engineer was badly scalded, and the train ran until it stopped for lack of steam.

8th, on Manhattan Elevated, Third Avenue line, at Houston Street, New York city, cylinder head of an engine of a passenger train was blown out.

12th, on Portland & Rochester, at Alfred, Me., parallel rod of engine of passenger train broke.

12th, on Old Colony, near Roxbury, Mass., engine of passenger train exploded its boiler. The engineer put on the air brake and reversed, "the moment the boiler burst."

13th, on Pittsburgh, Cincinnati & St. Louis, at Newark, O., passenger train ran into a street car at a crossing, damaging the forward end of the engine.

13th, on Pittsburgh, McKeesport & Youghiogheney, at Douglass, Pa., engine of work train exploded its boiler, wrecking engine and caboose and setting fire to the latter. Engineer and brakeman killed and three other trainmen injured. This accident was by mistake included in the January record.

24th, on Seattle, Lake Shore & Eastern, at Great Bend, Wash., a large log rolled, butt-end first, off a flat car of a moving freight train. The lighter end was driven back through the caboose, injuring a trainman.

27th, on Central Pacific, near Blue Creek, Utah, mail car of westbound passenger train was found to be on fire. The train was run very fast six miles to a tank, but its contents were totally consumed.

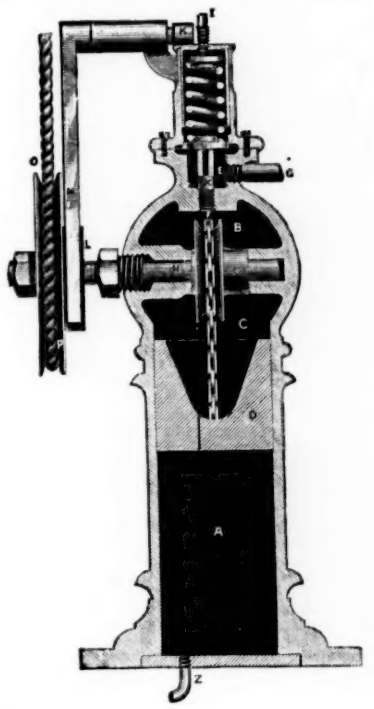
28th, on Denver & Rio Grande Western, at Salt Lake City, Utah, boiler of frozen steam heating apparatus in a car of passenger train leaving the station exploded with considerable force. Three passengers injured by pieces of flying casing.

A summary will be found in another column.

Mason Steam Damper Regulator.

The steam damper regulator illustrated recommends itself because of its simplicity. In applying the regulator it is only necessary to fasten it to a shelf in some convenient position, make a steam connection to the boiler and attach it by a chain to the damper. A screw shown on the top regulates it for varying boiler pressures.

Its operation is as follows: Steam from the boiler enters through the pipe *c* and passes into the chamber *E*, on top of which is a diaphragm on which rests the spring *s*. When the boiler pressure rises above the desired point the diaphragm rises against the spring, and steam passes down the passage *X* to the upper surface of the piston *D*, which it forces down. This piston being connected with a wheel on the shaft *H* by a chain, or in some cases by a rack and pinion, causes that shaft to rotate, thus communicating motion to the rope or chain wheel on the outside, as shown at *O*. From this wheel the rope passes over pulleys to the chimney damper lever and to a counterweight. When the pressure falls the diaphragm returns to its seat covering the passage *X*, and the piston returns to its original position.



It has been found objectionable to use a regulator that constantly opens and closes the damper to its full capacity, and to obviate this a compensating lever is provided, shown at *M*, which rests on a cam *L*. When the shaft *H* turns this lever is thrown over and works a cam *K* above the spring chamber, which changes the tension on the spring as soon as the regulator commences to act. With this compensator the damper is prevented from rapid oscillations and the draft is steadier. The device is furnished either with or without the compensator, as desired. A small pipe *Z* is provided below the piston chamber *A*, which carries away condensation and any steam which may enter the chamber in which the piston is loosely fitted.

This device is put on the market by the Mason Regulator Co., of Boston.

Electric Motors in General Railroad Work.*

The electric motor for street car service is an accomplished fact, as some hundreds of miles of road in daily operation bear witness. So far as practical success is concerned, the electric railroad is past the experimental stage and is in the beginning of the commercial era. A good proportion of electric railroads now regularly use trailers attached to their motor cars, and sometimes trains of two or more. To meet this demand for trains rather than single cars a heavier type of motor has been introduced and even heavier ones are being projected. A powerful motor car with a couple of trailers attached cannot fail to suggest to the mind a possibility of a still more powerful car at the head of a procession of a couple of baggage cars, two or three day coaches, and as many more sleepers. Enough experiments have already been tried to show that motors nearly or quite as powerful as an ordinary locomotive can be readily made and handled.

Some recent changes in street railroad practice may prove suggestive in this connection. The voltage in general use has been constantly rising. Less than two years ago a well-known electrician said that he did not favor the use of more than 400 volts for railroad work; there are now many roads on which from 525 to 550 volts at the station is the rule; and pressures as low as 400 volts at the station are quite the exception.

This increase in voltage is probably a distinct advantage. In the early days of electric railroading, a couple of years ago, the art of insulating armature and field coils was by no means as highly developed as it is now, and I think we shall soon reach the point where the voltage used for railroad work will only be limited by considerations of public safety, and only, therefore, when overhead circuits of bare wire are used. If we are ever to use powerful motors at a long distance from the generating station, the necessity of high voltage is apparent. The possibility of using high voltages need not be questioned, for in the experiments of Deprez, and the more recent experiments at Kriegsteten, potentials from 2,000 to 6,000 volts were quite successfully used. The necessity for high voltage may compel us to use Gramme armatures to secure insulation, but there is no serious obstable. Another recent important improvement in motor work is the very general use of carbon brushes, which has facilitated the operation of railroad motors in a most remarkable manner.

In looking at the possibility of handling large trains with motors two questions naturally arise before we can even consider the advisability of attempting it. First, can we readily build a motor to handle railroad trains at railroad speeds? To this question I think we can unhesitatingly answer yes. The experiments of Mr. Daft on the New York elevated roads make it very clear that we can build motors large enough to do the work with every hope of success. In those experiments trains of the

* Extracts from a paper by Dr. Louis Bell, of the *Electrical World*, read before the Chicago Electric Club, March 17.

ordinary weight for elevated work were handled at a speed higher than that required by schedule time. Aside from this, stationary motors of equivalent size are already in use in mining operations. In fact, with large motors, say from 50 to 150 H. P., we should expect to obtain rather greater efficiency than in the sizes more generally used.

The second question before mentioned is; can we rely on a motor with anywhere near the same feeling of certainty as on a locomotive? A couple of years ago we should have been compelled to answer this question in the negative, but the great and rapid improvements that have been made in insulation and the various details of construction make one hesitate in giving that answer.

Putting aside then these questions, as those that can be reasonably answered in the affirmative, we come to another vital question: Can the requisite amount of power be transmitted with a tolerable degree of economy, to the distances required? This question we are now in a position to answer. It is apparent, I think, at first sight that we cannot expect to distribute over very long distances without a frightful sacrifice of economy. The electromotive forces used are somewhat limited by the possibilities of insulation, and economy of long distance transmission can only be secured by very high electromotive forces or an enormous expenditure of copper. The immediate solution of this difficulty is to operate the line in sections of reasonable length, and this of course can easily be done. This at once raises the question, what is reasonable length? And to answer this question, we should have to investigate each special case in detail, for the most economical length of section would involve the relation between the loss of power in transmission over a long distance, and the increased expense of shortened sections, a ratio which evidently involves too many variables to admit of a general valuation.

I will now consider the power which might be required and the economy that might be obtained in an actual case, taking a single section for an illustration:

The case which I am going to suppose is a transformation of the Big Four line from Chicago to Cincinnati into an electric road, so far as passenger trains are concerned. The length of the line is a trifle over 300 miles, and I shall suppose it to be divided into some ten or twelve sections, each with a power station at its middle point. This arrangement of the power stations evidently will secure the greatest average economy. The road is a single track one, and the hypothetical section which I shall investigate is the section between Kankakee and Sheldon, Indiana, a distance of 30 miles. I take a case of this sort to show what will be the actual power required and the approximate economy in case of an actual railroad running its regular trains on its present schedule time.

Looking over the time table of the Big Four line, between Kankakee and Sheldon, we should find that by changing the time of two local trains from Kankakee to Sheldon, which do not connect with anything, and by changing that time only a few minutes, it would never be necessary to operate more than one train on the section at a time. Making these changes, the hours of supplying power would be 10:25 a. m. to 3:10 p. m., 10:25 to 11:32 p. m., 3:20 to 4:30 a. m. The problem then resolves itself into supplying power enough to operate an ordinary train at the usual speed, and at a maximum distance of 15 miles from the power station.

Let us now suppose the motor to work at 1,500 volts at its terminals at the end of the section. The power required to operate the train would be about 200 to 250 H. P. at the average speed, consequently the current transmitted over the line would be 100 to 125 amperes.

Of course, we might suppose any number of hypothetical line equipments, but I shall confine myself to one in which the amount of copper required will not be specially forbidding. I shall suppose a line wire No. 0, connected at short intervals to a bare trolly wire of silicon bronze or some similar alloy. I should suppose track and ground systems to be made in the ordinary way. The length of conductor on each side of the central station would be about 79,000 ft., and the fall of potential for 100 amperes over this distance would be a little over 500 volts. The generator, therefore, would have to develop a little over 2,000 volts, and the line efficiency at the terminals of the section would probably be somewhere near 75 per cent. The average line efficiency for the entire section would probably be somewhere near 85 per cent. The total amount of copper required for the section would be about 110,000 lbs., including insulation, or about 3,600 lbs. of copper per mile.

With, therefore, this amount of copper, which seems not at all excessive, we should have an average line efficiency of about 85 per cent. Now assume a commercial efficiency of the generator of 90 per cent., and assume for the efficiency of the motors and gears 80 per cent., which for motors running at high speed and with infrequent stops, does not seem an excessive estimate, the mean commercial efficiency of the combination would be a little above 60 per cent. In other words, taking into account all sources of loss, we should probably have an efficiency of a little over 50 per cent. from the indicated horse power at the engine, to the power supplied at the axles of the car.

Now let us look a little further and see the amount of power which would have to be supplied to the section which we have been considering. Looking over the time schedule we see that power is required for almost exactly seven hours, and to supply the 200 H. P. necessary at the train we should have to furnish about 400 H. P. indicated at the power station. We should, therefore, furnish 2,800 H. P. hours to the section under consideration, and we should have the advantage of being able to use compound condensing engines. These engines ought to be able to furnish the indicated horse power hour on 2 lbs. of coal; the coal required for our supposed section then would be 5,600 lbs. for the 24 hours. Banking fires between runs would consume some little coal beside, but with proper engines and good firing the 2,800 H. P. hours ought to be furnished on three tons of coal. For express speeds, of course, 200 H. P. would be too small, and coal consumption would be larger, while the line efficiency would be slightly lower. Still, in our supposed case, we would count on a mean efficiency of 50 per cent. from indicated horse power to train, for, while fast trains would entail greater loss in the line, the average figure would not be seriously lowered. This amount is probably a trifle less than would be required by the locomotives doing the same work.

We are now in a position to form a tolerably clear idea of the probable cost of equipping such a section as we have been discussing. We shall require for equipment a 400 H. P. compound condensing engine and dynamos to match, then we shall require, as before mentioned, a little less than two tons of copper per mile. In return for the investment in these items, we get an average commercial efficiency of a little over 50 per cent., and the question to be raised is the exceedingly practical one, Will it pay? We gain the advantages of being able to use a very economical engine and of being able to dispense with a certain number of employés. To make these gains we content ourselves with an efficiency of 50 per cent.

Let us now look at the locomotive a little for the purpose of seeing whether we are going to gain enough in saving coal and wages to pay for 40 or 50 per cent. energy lost in the various transformations of the electric system. There seems to be a widespread popular delusion to the effect that the locomotive is an exceedingly uneconomical machine. On the contrary, the figures of actual tests show that the locomotive compares very favorably with ordinary non-condensing engines of similar size.

As it is now, the locomotive appears to be rather more economical than the average non-condensing single engine, but if the locomotive is ever pushed hard by any other motive power, it will be developed in the direction of compounding. It would appear then that the saving of fuel effected in the electric system would practically be that due to the difference between condensing and non-condensing engines. The saving in fuel would probably be about one-half. The saving in employés would be comparatively small, as two or three men would be required to operate each power station.

The margin of economy, therefore, between an electric system and locomotives appear to be about enough to balance the losses in the transformation in the electric system. This latter, however, has two additional advantages that tend to economy. In the first place, a somewhat cheaper grade of coal can be used with a stationary engine, because better firing is possible. In the second place, an electric locomotive would have a decided advantage in the matter of weight efficiency which insures a slight economy in power. I should say that an electric locomotive, of the power we have been considering, would weigh from 30 to 50 per cent. less than an ordinary locomotive with its tender. One instinctively asks if this lighter weight does not mean decreased tractional power. And hence, does it not work to the disadvantage of the electric locomotive? This opens the question of the effect of using the rail return for the current which supplies the power. Most of those who have studied the subject, think that the adhesion is somehow greatly increased by the passage of the current from the wheel to the rail. So far as I am aware, there are no experiments under anything like working conditions, which give us a definite idea of the facts. That the general opinion is well founded, I have little doubt, and in looking over some of my note books, I have found some experimental evidence. This was a fact, well known I presume, to others who have experimented on electric cars, that the ratio between the power required to start a car and that required to keep it in motion is quite out of proportion with the results one would expect, judging from dynamometer tests on ordinary street cars. I am of the opinion that the increase in adhesion even under ordinary working conditions is very considerable. Where very heavy currents are used, we know from actual experiment that such is the case, as has been shown by Mr. Ries.

And this naturally raises the question as to the possibility of reaching very high speeds by the use of the electric locomotive. Of course in any case increased speed means greatly increased power, and the question then becomes one of comparative weight efficiency and adhesion. This comparison is certainly to the advantage of the electric motor; but we must remember that the limitations upon railroad speeds to-day are not those set by mechanical difficulties, but by considerations of safety and economy, and these do not change in any marked degree with a change in the motive power. If it would pay to run railroad trains at an average speed of a mile a minute, it would have been done long ago, and there is no reason to expect that the use of electricity would quicken the running time, unless the public demanded it, and felt quite safe and reassured at the prospect of being hurled through space at the rate of a hundred miles per hour, or thereabouts. If there should be an imperative demand for very high speed, I think one may roughly estimate that the use of electricity would nearly double the speeds now in use, but the question of these very high speeds is purely a question of dollars and cents, for, as a rule, very fast trains are not found to pay particularly well.

In the case of a suburban road the saving in wages would be considerable, since one power station would suffice for the whole system, and the same, of course, is true of any large system operated from a single station. The Illinois Central suburban trains, for example, might be run electrically with great advantage to the public, and probably to the company. Smaller and more frequent trains would work wonders in the suburban traffic, and the absence of smoke and dust would be a blessing to residents along the lake front

I have been considering up to the present the sort of railroad work most unfavorable to electricity; that is, general work over long distances. There are, however, certain cases in which, even now, electricity could be employed to great advantage. For example, take railroad lines between neighboring cities, where the passenger traffic is large and frequent trains are run. If there were two competing roads, one operated by electricity and the other by steam, I should expect at least 50 per cent. more travel on the electric road, by reason of its freedom from dirt and smoke and attendant inconveniences. The same, I think, would be true in the case of very many suburban roads, and in these cases where the distances are comparatively short, I should expect lessened running expenses by the use of electricity.

The case, however, where an electric system would work to the very best advantage, is the elevated railroads. In such a case we have a compact system which could be supplied from a single power station in the most direct and economical way. The damage to neighboring property would be enormously lessened, and the present objections to an elevated system would be in a great measure removed. Of the success and economy of an elevated electric system there can be no reasonable doubt, and I would go so far as to say, that in view of what can be accomplished by electricity, there is no reasonable excuse for permitting the use of ordinary locomotives on an elevated system. The question has never been properly agitated, but if it were, I can see but one possible result. The difficulties of running an elevated system by electricity are immensely less than those encountered in the operation of a great street car system, like that in Boston. In particular the bugaboo of electric railroad men—repairs—would dwindle into insignicance; for lifted from the dirt and mud of the street, an electric motor can readily be given such care as would reduce the repairs to a comparatively small figure.

Let us look into the gain that could be made by using electricity on an elevated line. It is, I think, a peculiarly favorable case, and we, fortunately, have the facts and figures at hand to determine its probable advantages. I will put aside for the moment everything except considerations of economy and running expenses, and I will turn to the New York elevated system for our facts.

The locomotives on the Manhattan railroad work under conditions anything but favorable to economy. They are on duty 20 hours per day, and of that time steam is admitted into the cylinder but 6 hours. The full horse power of the engine is 185, the mean horse power is said to be 70.3; as a natural result of this the coal consumption is high, being 6.2 lbs. per horse power hour. Now, let us count the cost of fuel for each engine, and we have an average consumption of 435 lbs. of coal per hour. What coal consumption will be required to furnish 70.3 mechanical H. P. on an electric system of distribution? In the first place, we shall have the advantage of being able to use triple expansion condensing engines, and the corresponding coal consumption is about two pounds per horse power hour. This would mean something like 15 pounds of water, certainly a reasonable figure. I shall allow 125 I. H. P. to furnish the 70.3 H. P. required. This certainly is a liberal estimate, meaning as it does an efficiency of only 56 per cent. from engine to car. This allows 90 per cent. efficiency for the dynamos, 90 per cent. efficiency for line, and a little less than 70 per cent. commercial efficiency for the motors. This estimate is surely within safe limits, for if 90 per cent. is high for the line, surely 70 per cent. is low for the large motors, for at least this figure can be secured with a good street car motor.

Against then 435 lbs. per hour of coal required for the locomotive, we have 250 lbs. of coal per hour required to furnish the same power to the train electrically; and beside, the coal required for the locomotive is of a higher grade than that which would be used with a stationary engine, for it has been found best on these small locomotives to use a rather high grade of coal, whereas I have estimated the coal consumption for the stationary engine on the basis of a cheap coal, having an evaporative power of 7 to 7.5 lbs. of water per pound of coal, and costing less than $2 per ton in New York. Bearing in mind these figures, we see the saving of fuel must mean considerable. The coal for the New York elevated road costs over $700,000 per year. In view of the facts I have just set forth, I think on a conservative estimate there will be a saving of $400,000 per year by generating the power at the central station and distributing it electrically. This means lessening the operating expenses of the system by a very perceptible amount. Aside from the bare cost of fuel, the saving of the handling of coal and ashes and furnishing water, will be no small item.

But even this great saving in operating expenses would not represent the saving which could be effected in operating a new elevated road by electricity. In the first place the damage to adjoining property would be enormously lessened by avoiding the noise, smoke and dirt of a locomotive. In fact, I believe that the saving in the cost of right of way would go far toward paying the expenses of equipping the road electrically. But this is not all. The use of locomotives makes necessary the use of larger train units. Larger train units mean, on the score of safety, running at rather less frequent intervals, and that in turn means giving up that as yet unrealized ideal of rapid transit, small trains running at such frequent intervals that it would never be worth while to run for one. With lighter trains running at more frequent intervals, the strain on the supporting structure would be greatly lessened, and the load more uniformly distributed. Consequently the whole structure would be made light in appearance and reality, costing considerably less and being far less unsightly than those now in use. Taking this into account, it seems very probable that an electric elevated railroad could be built and equipped at a less cost than if it were to be operated by steam. The great ease with which train units are handled on an electric system should of itself be the strongest possible recommendation.

To sum up I would state my firm conviction that the most of us will live to see electricity come into extensive use in general railway work, certainly for special and suburban roads, possibly for long through lines.

Union Switch & Signal Co.

The annual meeting of this company was held March 12. The earnings for the year ending Dec. 31, 1889, were $575,749; operating expenses, $505,399. After payment of old accounts, interest and discounts, there remain $23,070 available for dividends, which paid 6 per cent. on the preferred stock outstanding. The contracts made during 1889 amounted to $555,126, being an increase of 12¾ per cent. over the preceding year. For the first two months of 1890 the orders received were $117,190, an increase of 63 per cent. over the corresponding period of 1889. As to the outlook for the present year the report says: "We had during the year 1889, and up to the 1st of March, plans which require signaling, and for which we sent out proposals involving $1,000,000. Of these we received a little over 50 per cent., which leaves proposals out and still under discussion by railroad officials, on mechanical interlocking, amounting to $470,000. In the past six months we have submitted our plans and estimates for some $830,000 worth of Westinghouse pneumatic interlocking and block signaling. Taking the prosperous condition of the railroad interests of this country into consideration, we feel as if we ought to have during the present year a very much larger business than ever before."

Mr. E. H. Goodman was made General Manager in place of Mr. Henry Snyder, who lately died. Mr. R. H. Soule is Assistant General Manager and General Sales Agent.

Waterworks Architecture.

Cash prizes offered by the *Engineering and Building Record*, of New York, last December, for designs for a pumping station and water tower, brought together no less than 112 designs, 56 for each structure, and the award of prizes has just been made.

The awarding committee were: Edmund M. Wheelwright, of Boston; John W. Root, of Chicago; Amos J. Boyden, of Philadelphia; F. A. Wright, of New York, all well known architects, and Dexter Brackett, Engineer of the Boston Waterworks. The first prize was given to Elmer Grey, of Milwaukee; the second to James C. Green, of Brooklyn; the third to R. C. Spencer, Jr., of Boston, and the fourth to J. A. Schweinfurth, of Boston. Thirteen other designs, or rather pairs of designs, for both structures were included in each case, were given honorable mention, and the merit of many of the others is spoken very highly of. The designs are now on exhibition.

Railroads Having Air Brakes on Freight Cars.

A pamphlet recently issued by the Westinghouse Air Brake Co., gives the following list of railroads in the United States, Canada and Mexico having freight cars equipped with the Westinghouse brake. The number of cars equipped is said to have been corrected up to Jan. 1, 1890.

Name of Railroad.	Cars Eq'd Jan. 1, '90
Atchison, Topeka & Santa Fe	19,619
Atlantic Coast Line	550
Atlantic & Pacific	665
Baltimore & Ohio	50
Boston & Albany	75
Burlington & Missouri River in Nebraska	267
Chesapeake & Ohio	109
Chicago & Alton	306
Chicago, Milwaukee & St. Paul	500
Chicago & Northwestern	405
Chicago, Burlington & Quincy	2,657
Chicago, Rhode Island & Pacific	1,864
Choctaw Coal & Railway Co.	102
Cleveland, Cincinnati, Chicago & St. Louis	591
Colorado Midland	997
Denver & Rio Grande	1,145
Rio Grande Western	500
Denver, Texas & Forth Worth	30
Duluth & Iron Range	1,126
Kansas City, Fort Scott & Memphis	111
Fitchburg	630
Grand Rapids & Indiana	10
Hannibal & St. Joseph	36
Houston & Texas Central	125
Intercolonial	525
Interoceanic	258
Kanawah & Ohio	20
Kansas City, St. Joseph & C. B.	42
Kansas City, Wyandotte & Northwestern	506
Louisville & Nashville	27
Mexican Central	586
Mexican International	200
Mexican Pacific	109
Michigan Central	994
Milwaukee, Lake Shore & Western	270
Mobile & Ohio	129
New York Central & Hudson River	351
New York, Chicago & St. Louis	152
New York & New England	35
New York, Lake Erie & Western	581
New York, New Haven & Hartford	100
New York, Ontario & Western	26
New York, Pennsylvania & Ohio	466
Northern Pacific	7,853
Old Colony	168
Oregon Railway & Navigation Co.	666
Penna. East of Pitts. & Erie	3,795
" West " " (Southwest System)	1,825
" " " " (Northwest System)	3,338
Philadelphia & Reading	158
Philadelphia, Wilmington & Baltimore	452
Pittsburgh & Western	89
Raleigh & Gaston and R. & A. A. L.	50
Richmond & Danville	1,988
St. Joseph & Grand Island	900
St. Paul, Minnesota & Manitoba	600
Seaboard & Roanoke	55
Seattle, L. S. & Eastern	144
Southern Pacific Co.: Pacific System	14,361
" " " Atlantic System	2,030
Spokane Falls & Northern	100
Texas & Pacific	40
Toledo, Peoria & Western	56
Union Pacific	15,205
Wabash	400
West Shore	443
Merchant's Despatch	1,900
Private Companies' Cars	7,009
Miscellaneous (orders from 44 different railroad cos)	1520
Total	101,973

The total mileage of these companies is about 88,000 miles.

TECHNICAL.

Locomotive Building.

The Baldwin Locomotive Works have recently built for the MexicanCentral five Mason-Fairlie locomotives with three pair of coupled drivers. Four other heavy locomotives have been received by the company recently and three more are now building.

The Pacific Short Line has received two large freight engines from the Rhode Island Locomotive Works.

The Brooks Locomotive Works have completed two passenger engines for the Milwaukee & Northern.

A new passenger engine has been recently built at the Susquehanna shops of the New York, Lake Erie & Western.

The Rio Grande Western is rebuilding four of its narrow gauge engines for service on the standard guage division. The New York Locomotive Works this week delivered two more standard guage engines, which with two now building completes its order. They are lighter than those previously delivered. The company has now in service 10 standard gauge engines.

The Mexican (Vera Cruz line) has lately received some large Fairlie engines from Neilson & Co., of Glasgow, Scotland. The engines have six pairs of drivers, the driving wheels being 3 ft. 6 in. in diameter.

The Windsor & Annapolis has received a new locomotive from the Portland Co., of Portland, Me.

Car Notes.

The Boston & Albany is building at its Allston shops 40 of the dump cars described in the *Railroad Gazette* of March 7. Two new 60-ft. combination baggage and smoking cars have just been completed.

The Buffalo shops of the New York Central & Hudson River road have recently built 24 new cabooses and 12 baggage cars. A number of box cars are also being built. About 800 men are being employed at present.

The Mexican Central has recently received 10 first class and eight third class passenger cars, 25 cabooses, 15 baggage and 100 box cars, and 12 iron water tank cars; 200 box cars are yet to arrive.

The United States rolling Stock Co. has delivered to the Georgia Southern & Florida the first lot of 500 freight cars which it is building at its Anniston and Decatur shops. The cars are equipped with air brakes and the Gould coupler.

The Missouri, Kansas & Texas is to purchase a private car for the receivers at a cost of about $12,000.

The Indianapolis, Decatur & Western has completed two cabooses from designs by the Master Mechanic. They are 34 ft. long and have two four-wheel trucks.

The Louisville, St. Louis & Texas has received four new passenger cars from the Jackson & Sharp Co., of Wilmington, Del.

Holt Bros. of Stockton, Cal., have just built five new cars for the Seattle Madison St. Cable Line. They are 28 ft. long and seat 32 people. One-half the car is open and the other half closed.

The Tyler Car Manufacturing Co., of Tyler, Tex., is building a number of cars for the International & Great Northern.

The car shops of the Cape Fear & Yadkin Valley are turning out 25 platform and eight box cars per week.

Bridge Notes.

The Smith Bridge Co., of Toledo, O., has been awarded the contract for building a bridge over the tracks of the Kansas City, Memphis & Birmingham at Twenty-first street in Birmingham, Ala. The bridge is to be 907 ft. long, with one span of 96 ft. It will be 40 ft. wide, with a 28-ft. roadway, and two footways each five ft. wide. The contract price is $29,200.

The contract for constructing and erecting nine combination bridges for the Missouri Pacific system has been awarded to Shailer & Schniglau, of Chicago.

The Bullen Bridge Co., of Leavenworth, Kan., has been awarded the contract for building the state bridge across Gunnison River, Delta County, Colo., by J. P. Maxwell, State Engineer. The contract price is $17,289. The structure is to be of iron with two spans 180 ft. and 196 ft. long, and is to have masonry foundations.

Anderson & Barr, of Jersey City, have taken a contract in connection with the Union Bridge Co. for the railroad and highway bridge over the Arkansas River, at Fort Smith, Ark. The bridge is to consist of 10 fixed spans, each 200 ft. long, and one draw span 370 ft. long. All the foundations, except the two abutments, are to be on pneumatic caissons.

The Rochester Bridge Works, of Rochester, N. Y., are building a 95-ft iron bridge, at Tuscarora, N. Y., for the Western New York & Pennsylvania, and the Union Bridge Co., of New York City, is building a three-span steel bridge, 527 ft. long, for the same road, at Warren, Pa.

The City Surveyor of Utica, N. Y., has asked proposals until April 4, for the construction of a plate girder wrought-iron viaduct over Ballou's Creek.

The Board of County Commissioners of Clark County, Ind., have ordered a new iron bridge to be built at once over Cane Run Creek, near Jeffersonville. Trustee Oglesby, of Jeffersonville, will shortly ask for bids.

The Smith Bridge Co., of Toledo, O., has been awarded a contract for building a county bridge, 75 ft. long, across Bear Creek, near Fort Worth, Tex. The contract price is $2,620.

The town of Mt. Vernon, Ill., is to build a new bridge on the Spring Garden road to replace one recently destroyed.

The New York, Lake Erie & Western proposes to build a new bridge over the Tonawanda Creek, at Batavia, N. Y.

The Berlin Iron Bridge Co. has secured the contract for building a steel arch bridge near New Haven, Ct., for $3,192. Twelve other bids for the work were received by the city engineer.

The West Seattle Cable Railroad proposes to build a drawbridge between Seattle and West Seattle, Wash.

A board of United States army engineers has been detailed to consider the plans for a bridge which the Clinton & Illinois Bridge Co. proposes to erect across the Mississippi River at Stony Point, near Clinton, Iowa.

The Norfolk Southern will receive proposals until April 10 for building three counterbalance pivot draw bridges. One bridge will have 60 and 30 ft. arms, and the other will have 50 and 25 ft. arms.

It is stated that the Rockbridge Co., of Lexington, Va., will build bridges across the North and James rivers at Glasgow.

The Park Commission, Rochester, N. Y., has been asked to appropriate funds to build two bridges over Red Creek.

The Temiscouata Railroad will soon let the contracts for the superstructure of a 150-ft. iron bridge at Edmundston, N. B.

The Philadelphia & Reading's new bridge at the Falls of Schuylkill, near Philadelphia, will be finished by April 1.

The County Surveyor at Kansas City, Mo., will soon let the contracts for building three bridges in Jackson County, near Independence, estimated to cost respectively $900, $1,500, and $2,650.

E. M. Cole, County Superintendent, has let a number of contracts for bridges to replace others destroyed in the recent floods. Most of the structures are over small creeks.

A bill has been introduced in the Ohio Legislature to authorize the Commissioners of Franklin to construct a bridge across the Scioto River.

The work on the Kansas City, Fort Scott & Memphis bridge across the Mississippi River, at Memphis, is progressing. The western pier is now 20 ft. above the river, and the one next to it is 10 ft. above the surface of the water. The piers are being constructed of blue limestone.

The projected bridge over the St. Lawrence River from Montreal to the Isle Ronde and Longueuil is being opposed by the Harbor Commissioners Montreal and other influential bodies, and the charter for building the bridge will probably be refused. The plans filed show a cantilever bridge 150 ft. high.

A 50-ft. iron bridge will be erected at Houston, Tex., by the International & Great Northern.

Five new iron bridges have been built in the past few months in Wood County, W. Va., and are practically finished, but have not yet been formally accepted. Three of the structures are across Big Tygart Creek at Toncray's mill, at Cooper's store and at Owen's mill; one is across Slate Creek, on the Parkersburg and Elizabeth road and the other is across Pond Creek at Boso's mill.

Bills are before Congress authorizing the construction of bridges at the following places: Across the Minnesota River between Hennepin and Dakota County, Minn.; across the Mississippi River at South St. Paul, Minn.; across the Missouri River at Chamberlain, N. D., and across the Arkansas River between Argenta and Little Rock, Ark.

Bridges are proposed across the Red River of the North at Grand Forks, N. D.; across the Missouri River at Pierre, S. D.; at Davenport, Ia., and at Elizabeth, N. J.

The firm of Cofrode & Saylor, of Pottstown, Pa., builders of bridges, piers and wharves, has been chartered as a stock company, under the name of Cofrode & Saylor, incorporated. Francis H. Saylor is President; Joseph H. Cofrode, Vice-President; J. E. Challenger, Secretary and Treasurer, and F. H. Saylor, J. H. Cofrode and P. R. Foley, directors. The capital stock is $500,000. The entire business of the firm has been transferred to the company. The Reading Rolling Mills Co., whose works are at Reading, is operated by the same parties, but is a separate corporation. Cofrode & Saylor, incorporated, employ about 600 workmen at Pottstown, and at the present time 400 men are engaged in its outside operations. Cofrode & Saylor established works at Pottstown 12 years ago.

Manufacturing and Business.

Carl Binder and Maurice Seifert have formed a copartnership under the firm name of Binder & Seifert, as contractors and consulting engineers. They have opened an office at Room 803, Royal Insurance Building, No. 169 Jackson street, Chicago, and are prepared to make designs and estimates, to superintend and to contract for bridges, roofs and buildings, including foundations. Mr. Seifert has been a member of the firm of Gottlieb & Co. for the last five years. Mr. Binder has been bridge engineer of the Lake Shore & Michigan Southern till last spring, when he opened an office as consulting engineer at 44 Lakeside Building, Chicago.

The Dunham Mfg. Co. reports that many of the recent orders for the Dunham car door have been made from newly constructed roads. Some large orders have also been received from roads which have been using the door for some time.

As the announcement that the Aerated Fuel Co. has made the Gilbert & Barker Mfg. Co., of Springfield, Mass., general agents for the United States has led many persons to think that the other representatives of the former company had given up their connection with it, these representatives wish it understood that they are still the sole licensees for the Aerated Fuel Co.'s system for the territory assigned to them.

The Wainwright Manufacturing Co., of Boston, Mass., has just shipped seven corrugated copper tube condensers, having 200 H. P. each, to the Carolina Oil & Creosote Co., Wilmington, N. C.

The Safety Car Heating & Lighting Co., of New York, has arranged to equip several cars on the Rome, Watertown & Ogdensburg, Central of Georgia and Georgia Southern & Florida with the Pintsch gas system for tests.

The Chicago Railway Supply Co. has been chartered in Illinois to manufacture railroad supplies. The capital stock, $300,000, is subscribed for by M. N. Grable, E. M. Walker and T. A. Quinlan.

Forsythe & Co., manufacturers of perforated veneer seatings, have removed their office and factory to 135 Degraw street and 48 Tiffany Place, Brooklyn, N. Y.

The Rail Market.

Steel Rails.—The market is weak and dull, and quotations are nominally $34@$34.50 at Eastern mills; $33.50@$34.50 on cars at Pittsburgh mills, and $36@$37.50 at Chicago.

Old Rails.—There have been few sales, quotations at New York being $24.50@$25 for tees, and $21.50 for old steel rails.

Iron and Steel.

The Millvale Rolling Mill, at Pittsburgh, recently operated by the Millvale Iron Co., Limited, has been closed down for an indefinite period, and the plant will probably be placed in the market for sale.

Work is progressing rapidly in the new blast furnace of the Clinton Iron and Steel Co., at Pittsburgh, and it is expected to be in operation about April 1. It will have a capacity of about 100 tons per day.

The recently completed forge department of the National Forge & Iron Co. at East Chicago, is now running to its full capacity. The rolling mill is also running full. They consume 125 tons of scrap daily and produce over 100 tons of finished bar iron each day, and also 900 axles besides forgings. The company has enough orders booked to keep its mill and forge running for three months. The fuel used is crude oil. The number of men employed at present is 425, but the company intends building an additional 8-in. guide mill and two more steam hammers, which will increase the force to 600 men.

S. B. Haupt, President of the Roanoke Rolling Mill Co., and for some time Acting General Manager of the mills, has resigned the latter position on account of his duties as General Superintendent of the Roanoke Machine Works, and T. D. Morgan, of the Calumet Steel & Iron Co., of Chicago, has been elected to succeed him. It has been decided to add six puddling mills to the present equipment of the plant.

The steel works of the Colorado Coal & Iron Co. are making 150 tons of 65 lb. rails for the Denver & Rio Grande. The ore is from mines at Calumet, Hot Springs and Leadville. The reconstruction of the new blast furnace will be completed April 10 and will have a daily capacity of 125 tons of pig-iron. This, with the furnace started Nov. 26, will give the company a capacity of 250 tons of pig-iron a day.

The Leechburg Foundry & Machine Co., of Pittsburgh, has contracted with the Detroit Steel & Spring Co., of Detroit, Mich., for the construction of a 100-ton Aiken hydraulic billet mold machine.

The Pittsburgh Forge & Iron Co. is putting into its blacksmith shop an 1,100-lb. Bement Miles steel hammer. The works are running well on axles and forgings.

The Vulcan Iron Co., of New Castle, Pa., has recently added to its plant one 40-ton and one 20-ton Colliau cupolas, and also one of the Buffalo Forge Co.'s large steel pressure blowers; a 20,000-lb. Fairbank's compound crane beam scales, and an improved hoist for raising stock. A large ingot mold foundry is to be erected also.

Machine Shops Burned.

The machine shops of the Columbus, Hocking Valley & Toledo at Columbus, O., were burned March 14. The loss is estimated at over $50,000, partly insured.

Another Electric Drawbridge.

An iron drawbridge over the Christiana River in Wilmington, Del., is about to go into service, operated by electricity. The draw is 250 ft. long and 34 ft. wide, with a roadway and two footways. The total weight is about 200 tons. The motor is by the Thomson-Houston Co., and at a recent test turned the draw completely around in 1¼ minutes. The bridge is lighted with 14 incandescent lights, from the same current that supplies the motor. The bridge was designed by Mr. Albert Lucius, of New York, and built by Messrs. Dean & Westbrook, of New York. The total cost, including the motor, was $65,000.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Last week we gave a full report of a discussion before the New England Railroad Club on freight car couplers. By way of preparation for this discussion the club sent out circulars asking employés of the New England roads to state their choice of types of coupler. The result was 1,282 votes for link and pin couplers (1,239 for the Safford) and 641 for the M. C. B. type. The vote had about as much value as might be attached to a vote of privates of the war of the rebellion on magazine rifles for military service. Perhaps one in 1,000 of the veterans now living saw something of the performance of an inferior magazine rifle in actual service. Most of them have a more or less accurate knowledge of its development since the war. They would vote on the subject now with such native intelligence and good judgment as heaven has given them, and with a probable bias in favor of a weapon with which they are familiar. Much the same thing may be said of the discussion, It was all one sided and confined to men whose experience with the M. C. B. coupler had been very limited indeed. Of course, it was the fault of the vertical-plane men that they were not on hand to uphold their side of the question.

The amendments to the Interstate Commerce Law, introduced by the Chairman of the House Committee on Commerce, are extremely good. They prohibit commissions wholly; require that ticket agents shall have certificates of appointment: and forbid all other persons to deal in tickets, under penalty of $5,000 fine. Under the last head the provisions are so sweeping that some doubt may be raised as to their constitutionality. Provision is to be made for the redemption of unused tickets or parts of tickets. Last, but not least, a legal recognition is to be given to the routing of immigrants by mutual arrangement among the railroads. The bill is understood to have the approval of the Interstate Commerce Commission, which gives special significance to the last point. If the Commission sees its way clear to the recognition of what is virtually an immigrant pool, the same principles may be gradually applied to other lines of business. We have no hope of seeing the pooling clause repealed; but we have decided hopes that in certain lines where the evils of unrestricted competition are most apparent some effective means of dividing traffic may from time to time be devised. Under the proposed plan, the majority of immigrants will deal with a railroad association rather than with an individual road. There is no reason why the same idea should not be applied to freight. If an association or incorporated clearing house can be made so strong that the shippers would prefer to deal with it rather than with the individual roads, and look to it for responsibility in freight charges, detentions or damages, it would be the simplest thing in the world to treat its business in the same way in which the bill now proposed would treat the immigrant business.

Carload Rates.

The decision of the Interstate Commerce Commission in the carload cases is a substantial victory for the complainants. In the practical matter at issue the Commission holds that the differences between carload and parcel rates, on groceries are unreasonably great, and that the schedules must be rearranged. In the reasoning which leads to this conclusion, two principles are laid down which must have a bearing on American railroad methods in general, far beyond the limits of the case in hand. The first of these is that "a difference in rates upon carloads and less than carloads of the same merchandise between the same points of carriage so wide as to be destructive to competition between large and small dealers, especially upon articles of general and necessary use, and which, under existing conditions of trade furnish a large volume of business to carriers, is unjust, and violates the provisions and principles of the act."

And the second is that

"a difference in rate for a solid carload of one kind of freight from one consignor to one consignee and a carload quantity from the same point of shipment to the same destination, consisting of like freight, from more than one consignor to more than one consignee, is not justified by the difference in cost of handling."

In the first of these statements the Commission takes a wide view of the duties of railroads; in the second it takes a narrow view of their rights. We are not criticising the Board for this; we are simply pointing out the actual state of the case. The railroads must put large and small dealers as nearly as possible on an equality; they must not let comparatively small elements of railroad economy distress the performance of this large public duty. A railroad man cannot say that he has a right to sell transportation cheaper at wholesale in exactly the same way that a storekeeper would. He has a paramount duty to give the public equal rates, apart from narrow business considerations.

All this has a great deal of justification. The wholesale principle is often carried to a wholly unwarrantable extent. The late James Fisk, Jr., was taught by his father that he must not tell a lie for twelve and a half cents, but might tell eight for a dollar. The Interstate Commerce Commission obviously does not sympathize with this view; nor do we. But there is some danger of going too far to the other extreme. The obligation to put small and large dealers on an equality cannot be carried out indefinitely. You cannot put parcels and carloads on absolutely the same level. If it is decidedly cheaper for railroads to do business in large lots than in small, it is, in the long run, decidedly cheaper for the public to have its business done in that way. If a law produces bad railroad economy, it must ultimately prove bad economy for the public also.

We are just now in the midst of an effort to enforce such equality in two ways: equality between large and small places, under the short-haul clause, and equality between large and small shippers under the clause against discrimination. The first has gone so far that the public is beginning to feel some of its indirect evil results. The second has not yet reached this point, but there is some danger that it may soon do so.

The lack of economy in parcels, as compared with carload lots, is felt in several ways.

First, it involves more clerical labor to bill them, and look after them in various ways.

Second, it takes more time and more expense to load them.

Third, it interferes either with good use of equipment or with economy of handling. If the railroads keep their cars waiting till they get full loads for a single point, they may have to wait several days; if they send off the cars loaded light, they have a bad ratio of paying to dead weight; if they load one car for several different points, they make an enormous amount of work at the other end.

As far as concerns train economy, these points are appreciated by the Commission, but, as concerns terminals, we doubt whether it gives them the weight which they deserve. Possibly the full text of their opinion will put the matter in a different light from the abstract. We hardly see how any one could go carefully over Mr. Fink's argument on the subject without feeling that the difference in economy is very great. Mr. Fink's results are worth repeating. It appeared from his investigations that at the docks where miscellaneous freight was handled the average cost per ton for handling and loading was from 58 to 62 cents, while the average cost at carload freight dock was only 16 cents per ton. It also appeared from the testimony that the cost of unloading miscellaneous freight averaged about 23 cents per ton, while the average for carload freight was only nine cents. The aggregate terminal expenses per ton of miscellaneous freight were thus more than three times those of carload freight, while the absolute difference in expense was from 2.8 to three cents per hundred pounds.

If the carload quantity, under separate consignments, alluded to by the Commission, is actually furnished in a single lot, this difference in economy would not exist; but if it is delivered to the railroad in separate lots, and simply loaded into the same car, Mr. Fink's figures would exactly cover the point. In such a case it certainly seems as if the difference in economy would justify a difference in rates, on grounds of public policy as well as of railroad economy.

Faster Train Time.

With what S. W. E. says, on another page, of the absurdity of trying to compel the New York and Boston roads to run fast by law, we quite agree, and our readers know pretty well what we think of trying to run fast trains on slow track; but that there is an "American mania for fast time" which has "outrun all bounds" we do not admit. Our correspondent, who is certainly well read, will probably remember Messrs. Foxwell and Farrer's little book, "Express Trains, English and Foreign," published last year, in which are collected data of express trains in various countries as they were running in the summer of 1888. The figures for the United States were not complete or entirely accurate, but were in the main quite correct. The authors classed as express trains in the United States and England only such as made 40 miles an hour including stops. It appeared that the daily mileage of such trains in the United States was about 14,000. In England, with one-seventh the railroad mileage, the daily express train mileage was about 63,000 miles. Of all the "express" mileage in the United States, more than one-fourth was between New York and Philadelphia, that is on about $\frac{1}{17\frac{1}{2}}$ of the main line track operated in the United States that year. Over 44 per cent. of this 14,000 daily express mileage was on the Pennsylvania, about 17 per cent on the New York Central, the Michigan Central and the Lake Shore; 9 per cent. on the "Bound Brook" route, and the other 30 per cent. divided in very small quantities among 25 different roads. These 25 roads included and were almost confined to the very best roads in the country as regards physical condition and discipline. Among them were the Boston & Albany, the Old Colony, the New York, New Haven & Hartford, the Lehigh Valley, the Baltimore & Ohio (Baltimore-Washington line) and the Chicago, Burlington & Quincy. It must be remembered that on all of these latter roads the express mileage was confined to short portions of their track, presumably those portions especially well adapted to fast time.

These facts hardly seem to warrant S. W. E.'s assertion that "the American mania for fast time has outrun all bounds of reason." To be sure we do not know what he calls "fast time." By inference it is about 39 miles an hour for 234 miles, including stops. If he puts his standard at 35 miles an hour, the fast train mileage of the country will be at once immersely increased over the 14,000 daily express miles considered above, and perhaps we shall have to admit "a mania." We do not consider that the roads that furnish the 40-miles-an-hour mileage are doing anything hazardous or even unreasonable. On the contrary, we should consider most of them quite warranted in making considerably faster schedules if they found profit in it.

The complaints of slow time between New York and Boston are not only justifiable, but we have little doubt that they will result in quicker service before long without any legislation. The improvements now making on the New York, New Haven & Hartford and the Shore Line will lead to it. A 5-hour train by the shortest route (213 miles) would run 42.6 miles an hour; by the Shore Line (229 miles) it would run 45.8 miles an hour. By the latter route, at 41.6 miles an hour, the run could be made in 5½ hours instead of six as at present. We have daily trains from Jersey City to Washington, 229 miles, in five hours and 18 minutes, or 43.3 miles an hour, and from New York to Albany, 143 miles, at the same rate. The New York-Washington business is directly competitive, and the fast time to Albany is made by trains competing for Western travel. Unfortunately for those who must travel between New York and Boston, time has been ingeniously eliminated from the means of competition for that business.

Our correspondent's argument, boiled down, is simply that the roads having unprotected facing-point switches and inadequate regulations for spacing trains, should at once properly protect such switches

and introduce a block system. In this we entirely agree with him. The financial question involved in such improvement on the New York-Boston lines should not for a moment be weighed against the immense moral advantage that the perfected state of their roads would give the advertising departments of the several companies.

"What the Traffic will Bear."

Governor Thayer, of Nebraska, has written another letter, saying that speculators and gamblers have absorbed the 10 per cent. reduction on corn rates recently granted by the railroads, and that the farmers have got no benefit therefrom. He, therefore, demands another reduction. He does not tell us how he proposes to prevent the speculators from getting the benefit of the second reduction in the same way as the first. We can conceive of a man's asking that a policy should be continued *although* it did no good; but to ask for its continuance *because* it did no good is pretty bad logic even for a Nebraska governor.

If it be true that the 10 per cent. reduction did the farmers no good, the presumption is that the railroads were charging what the traffic will bear in the legitimate sense of the word. Down to a certain point, reductions in rates are met by an increase of demand on the part of the consumers. The prices of the goods at the market do not fall by the whole amount of the reduction in transportation charges. If the railroad reduces rates five cents, a fall of two cents in the market price may so increase the demand that it will absorb the supplies of corn which the producers are ready to move. In that case, the producer will get three cents more for his corn, while the railroads will have so much larger corn movement that the reduced rate involves no loss.

If, however, the supply of corn is in excess of consumers' immediate wants, the case is different. A reduction in rates will not be followed by anything like a corresponding increase in demand. A fall of five cents in the rates will simply cause a fall of about five cents in the market price. The producer will be no better off than he was before; the railroad will be worse off, because its reduction in price has been accompanied by little increase in volume of traffic.

So far from the interests of the railroads and the farmers being opposed to one another, it may be laid down as a general principle that, if a reduction in rates increases traffic largely, it will also increase the returns to producers; while, if traffic is not increased in amount farmers' prices will as a rule not increase. This does not mean that a railroad always makes rates as low as it ought to; but it means that the better a railroad man knows his business the more likely he is to consult producers' interests in consulting his own. It further shows how illusory is the hope that the evils of local over-production can be met by shifting the whole burden on the railroads.

Equally unsuccessful is the effort to protect consumers in any particular locality. Take a case which the Interstate Commerce Commission is now investigating, in connection with the effects of the short-haul clause. Until last year it was a recognized practice that the rate from Chicago to Liverpool should be less than the sum of the rail rate to the seaboard and the ocean rate to Liverpool. This seemed to discriminate against American consumers, who had to pay a higher price for the same service than was paid by foreigners. By a ruling of the Commission, this practice was virtually stopped. People are now beginning to inquire who got the benefit. Clearly, not the producers. As the Minneapolis *Tribune* says:

> "It is a matter of record that a rigid enforcement of the short and long haul clause cuts down the profit of Western producers on all grain marketed in Europe. The distance from Minneapolis to Liverpool constitutes a long haul of our wheat, and until New York and other seaboard cities complained of discrimination and insisted upon a strict enforcement of the Interstate Commerce law, the freight charge on wheat was less from Minneapolis to Liverpool than from here to New York. The long and short haul clause enables the cities on the Atlantic seaboard to levy tolls on Northwestern staples, and our producers are compelled to pay them out of their profits."

But when we come to inquire at New York as to the supposed benefit obtained from their levying tolls, we find few traces of it. The fact is that ocean rates are so high that the attempt to add them to inland rates is almost enough to kill the traffic—quite enough to kill the profits of rehandling. It comes back to the original position taken by the Minneapolis *Tribune*. The haul from Minneapolis to Liverpool, looked at from a business standpoint, is a unit. The railroads, by treating it as a unit, were giving the farmer a market for his surplus product, in a more effective way than they could otherwise do, by putting low rates where there was a chance for an actual extension of the demand. By forbidding the railroads to meet this demand, the law forbids them to to give the farmers practical relief in furnishing additional opportunity for selling their products. It cannot be too often repeated that the only way to give producers relief from the evils of overproduction, is to increase the quantity demanded; that a reduction in rates which does not correspondingly increase demand does the producer little good; and that any legislation or ruling which partially closes a market that previously was open, must be a source of evil to the farmers quite as much as to the railroads.

Platform Gates and Fences Between Tracks.

We print on another page an illustration of a neat, strong and simple gate used on the passenger cars of the Boston & Albany to prevent people getting on or off the cars at the wrong side of the train or at any unauthorized or dangerous places. This company has made use of gates for a number of years, most or all of its cars being equipped with another pattern, which the new device is intended to supersede. Other New England roads also use gates to some extent, though it appears from a recent decision of the Massachusetts Railroad Commissioners that one road had allowed its gates to stand idle because passengers made objections to the use of any barrier when it interfered in the least with their convenience. After a passenger was killed the commissioners ordered the railroad to use the gates regularly. The commissioners discuss the subject of safety at stations at considerable length in their annual report, and quote the rules of a half dozen railroads prohibiting the running of trains past a station while a standing train is loading or discharging passengers. The board recognizes that gates are only a partial preventive of the danger to passengers, the true remedy being a fence between the tracks which shall compel every one to go around, over or under. Instances have been brought to the attention of the board in which engineers, miscalculating the distance or time between themselves and another train, have rushed past stations at high speed just as an accommodation train had come to a standstill. The Pennsylvania standard fences are referred to, which are 4 ft. in height and so built as to be easily removed when track repairs are necessary. The Pennsylvania has a number of these fences where the space between the tracks is only 7 ft. The board deems 8 ft. space necessary.

Fences are in use, we believe, on various roads where the main tracks are only six feet apart, and most or all of these roads can doubtless say, with the Pennsylvania, that no accident has yet occurred by reason of such arrangement. So long as passengers keep on the cars there is no danger; and yet it must be patent to every one who has observed the narrow space between the cars and one of these fences that some day some one will jump or fall off a train and suffer injuries which will be claimed to have been aggravated by the presence of the fence. Even if the victim be grossly careless, or even intoxicated, the argument against fences might then be pushed with great vigor. There is room even in the most unfavorable of existing cases for a man caught on the track to lie down between the fence and the rail and escape injury from a passing train, but the necessity for the employment of fences at stations is now so increasingly great that all managers having to do with this department may well consider whether the main tracks should not be spread out at every station at least to 8 ft. and perhaps even more. Such a change would spoil the beauty of many tangents and be objectionable in other details, but practically there would be no great difficulty, except the cost, in the great majority of cases; and at many small stations, where freight buildings and side tracks are few, the expense would not be great. A more troublesome problem would be the maintenance of proper regulations after the fence was up. There would have to be a gate in it, and this would necessitate an attendant, where passengers are now left to look out for themselves.

The Boston & Albany has the usual rule to protect trains standing at stations, but on its four-track line all stopping trains use tracks 3 and 4, and those on tracks 1 and 2 run by stations at full speed, regardless of the rule, even where there is no fence. We have heard no complaints of this practice as being specially dangerous, though it is true, as the Commissioners say, that as a train starts away from a station people will *immediately* cross the track and run the risk of stepping in front of a moving train on the next track. The most effective provision for safety doubtless requires the employment of *both* gates and fences. Gates on the cars are valuable as a means of instructing the public in the right use of cars and platforms, and can be provided with comparative ease. The erection of fences necessitates more preliminary calculation and can be prosecuted with less haste when gates have been provided as a temporary safeguard.

Platform gates would occasionally save a passenger's life or limb if they were kept shut on both sides at all times when the train is in motion. Every now and then a train makes an unannounced stop on a bridge, and some careless passenger, thinking he has reached his destination, steps off and falls 25 ft., more or less. A closed gate would at least throw him upon his own responsibility.

A Review of the Subject of Counterbalancing Locomotives.

A letter in another column discusses the problem of counterbalancing when three cylinders are used. While it may not be important to investigate this special case of counterbalancing for immediate designs, yet the introduction of the compound locomotive may bring about conditions which will render three-cylinder locomotives advisable; particularly in the case of large consolidation, decapod, and mastodon types of locomotives, because of the large cylinders which would be required in compounding such engines.

With reference to the suggestions by "Tenax," it is but just to point out to what extent his deductions are true from a theoretical standpoint. The reciprocating parts of a locomotive can only be exactly balanced by a counterweight placed in the driving wheels when such counterweight is placed exactly opposite the crank pin, because the variation in the amount of balance required at different portions of the stroke of the reciprocating parts depends upon and varies with the cosine of the angle of the crank from the dead point. The force which counterbalances the reciprocating parts is the horizontal component of the centrifugal force of the balance, that is, the pull in the direction of the movement of the piston of the centrifugal force of the counterbalance, and this brings us directly to the conclusion that both the balancing force and the force to be balanced (reference now being made only to the reciprocating parts) depend upon the cosine of the angle of the crank from the dead point. As the cosine of the angle does not vary uniformly, it is easily seen that the angles of the counterbalance and the crank pin from the dead point must be equal, or what is the same thing, they must be opposite to each other in the wheel, in order that the horizontal pull of the counterbalance and the inertia of the reciprocating parts may vary alike, and this will be the case when the balance and the crank pin are opposite. When not so placed the variation will be unequal, and the equality of balance be destroyed except at one angle of revolution, which varies with the difference in position of the parts in the wheel. The bearing of this on the suggestion of "Tenax" is seen when it is noticed that in the method which he offers the counterbalance is not placed opposite to the crank pin.

This can also be readily seen from the formula for the horizontal component of centrifugal force of the balance, and that for the inertia of reciprocating parts as follows: P^1 being the horizontal pull of the counterbalance at any angle Z, and P being the inertia of the reciprocating parts at the same angle Z:

$$P^1 = \frac{W^1 r A^2 \, Cos. \, Z}{g \ (= 32)}$$

$$P = \frac{W R A^2 \, Cos. \, Z}{g \ (= 32)}.$$

The manner in which the forces to be balanced and the balancing force vary with the cosine of the angle and the square of the angular velocity is readily seen from these formulæ, in which W equals the weight of the reciprocating parts; R equals the radius of the crank; W^1 equals the weight of the counterbalance; r equals the radius of the centre of gravity of the counterbalance; a equals the angular velocity of the wheel, that is, the velocity of a point at a unit's distance from the centre of the wheel; g equals the force of gravity, or 32.

An equality of the balancing forces and the force to be balanced only exists when these expressions are equal, then the expression becomes, after cancellation, $W^1 r = W R$; which shows that to produce a perfect counterbalance the weight of reciprocating parts multiplied by the radius of the crank should equal the weight of the counterbalance multiplied by its radius or the distance of its centre of gravity from the centre of the wheel.

Owing to the inertia of the large mass of the engine itself, to friction and to other causes, it is not necessary that the weight of the counterbalance should be as heavy as would be indicated by this expression, and it is customary only to balance from 65 to 85 per cent., according to the conditions. To show clearly the value of a counterbalance in the manner suggested by our correspondent, one would better take a special case and substitute in the foregoing formulæ the special dimensions and conditions and trace the actual difference in the truth of balance during a whole revolution.

It is not to be wondered at that the question of counterbalancing is continually coming up when it is realized that locomotives are constantly found in service which are improperly balanced, some of which are built by manufacturers of the best reputation. Within about eighteen months no less than five cases have been reported where the track has been badly damaged by locomotives supposed to have been improperly counterbalanced, and which were so nearly correct that the locomotive runners did not notice anything peculiar about them. A very aggravated case has been reported from Australia

and continual complaints are coming in from civil engineers regarding the effect of the average locomotive on the permanent way. Several civil engineers have taken up this question of counterbalance, believing that they can wrestle with the problem better than mechanical engineers and locomotive builders are doing.

We have referred in the last year to several of the more important points with regard to counterbalancing. Some of them have not as yet been touched upon to any considerable extent. More might be said with reference to the advantage of a large number of driving wheels over which to distribute the weight of counterbalance needed for the reciprocating parts. This appears from an analysis of the effect of the different parts of the counterbalance on the track. That part which is used to balance the revolving parts produces no detrimental effect upon the rail, because it is always balanced by the parts which it is itself designed to balance. That portion, however, which is intended to counterbalance the reciprocating parts is free to act vertically, either to lift the wheel or to depress the rail. If all this balance is concentrated in one wheel, the effect on the rail is greater than if distributed among a number of wheels, and is greater in inverse proportion to that number.

In the *Railroad Gazette*, Dec. 20, 1889, page 838, a table, showing the comparative weights of the piston rod and crosshead was given, and attention is again called to the wide variation then shown in the weights of the parts to be balanced, and therefore the wide variation in the necessary amount of balance. Also in the same article reference was made to the advantage of increasing the diameter of the driving wheels for high-speed locomotives. One fact with reference to this last point was not mentioned, however, and it is an important one. It is with respect to the relative advantages of a decrease in the length of stroke and an increase in the diameter of the driving wheel in effecting a reduction of wheel pressure on the rail brought about by the action of that portion of the counterbalance used to counteract the reciprocating parts.

Referring to the two formulæ given above, it will be noticed that a decrease in the length of the stroke lessens in direct proportion the weight of counterbalance needed in the wheel—we are speaking now only of that portion of the counterbalance used to counteract the action of the reciprocating parts. Such a change does not alter the angular velocity of the driving wheel or the radius of the position of the counterbalance in the wheel, and therefore the result of a decrease in the length of the crank is to decrease the amount of balance required, and thereby decrease directly the effect on the rail in exact proportion to the decrease in the length of the stroke. On the other hand, if the diameter of the driving wheel be increased, the counterbalance is carried further from the centre of the wheel, and thereby the necessary weight of balance is decreased and the radius of the balance is also increased, which leaves the centrifugal force of the balance as it was before the change, provided the angular velocity is unchanged. But in this case for the same speed the wheel has a lower angular velocity; that is, it makes fewer revolutions per minute.

The reduction in the amount of balance and the effect on the rail in the case of the reduction of the stroke is directly in proportion to the decrease in stroke, or nearly so. The reduction in the angular velocity in the case of the larger wheel is in proportion to the increase in the diameter of the wheel. Now, from the formulæ for centrifugal force it will be noticed that the amount thereof varies directly as the weight of the balance and directly as the *square* of the angular velocity; therefore as the loss of power to turn the wheel in the cases of a decrease of stroke, or an increase of diameter of driver is the same for the same percentage of change in the length of stroke or diameter of wheel, it is clearly evident that for the same loss of power there is greater decrease in the effect on the rail in the case of the increase of the diameter of the wheel, which gives a proportionate decrease in the angular veloeity, than in the case of a decrease in the length of the stroke, which gives the same proportionate decrease in the weight of the balance, because the effect on the rail depends upon the square of the angular velocity, while it is only directly dependant on the weight of the balance.

To more fully illustrate this let us take an actual example. If we assume a 10 wheel locomotive having 19 × 24 in. cylinders and reciprocating parts that weigh 750 lbs., and it be decided to balance 86 per cent. of the total amount, the weight balanced in each of the three wheels on each side will be 200 lbs. The centre of gravity of the counterbalances in a 56 in. wheel is about 20 in. from the centre of the wheel. The weight, then, of the balance required will be 120 lbs. When acting vertically this portion of the total balance not being resisted will act to lift the wheel or depress the rail. The maximum amount of this action is the centrifugal force of the balance, and at 60 miles in this assumed case is 8,888 lbs.

If the stroke be shortened two inches, that is 16⅔ per cent., the weight of the counterbalance for the reciprocating parts will be decreased also 16⅔ per cent., and therefore the effect on the rail will be decreased by the same percentage, which reduces it to 7,407 lbs. This can be seen from the formulæ given above, which show that the effect of the balance on the rail varies directly with the weight of the balance, and the weight of the balance is directly proportional to the length of the stroke, when the weight of the reciprocating part remains constant; therefore a reduction in the length of the stroke causes a reduction in the effect on the rail in like proportion.

In the case of this same 10-wheeler an increase in the diameter of the drivers of 16⅔ per cent., the same percentage as in the case of the reduction of stroke, would change the rail pressure as follows: The increase in the diameter of the wheel would be 9⅓ in. The counterbalance would be moved outward in the wheel 4⅓ in. about. Its distance from the centre would then be 24½ in. The weight required would be 98 lbs. The angular velocity of the wheel, that is the velocity of a point at a unit's distance from the centre, in feet per second, would now be decreased, while in the case of the reduction in stroke it remained the same as before the stroke was changed. It was formerly 37.7. It now becomes 32.3. The rail pressure now is 6,536 lbs., which is more than the reduction brought about by a reduction in the length of the stroke in the proportion of 8,888—7,407 : 8,888—6,536 or 1,481 : 2,352. That is a decrease of 16⅔ per cent. in the length of the stroke, or from 24 to 20 in., reduced the effect on the rail, caused by the counterbalance, 1,481 lbs., while the increase of the diameter of the driver 16⅔ per cent., or from 56 to 65⅓ in., reduced the rail pressure 2,352 lbs.

This advantage may be more clearly stated in this way: While the power of a locomotive to pull a train varies directly with the stroke and inversely as the diameter of the driving wheel, yet the effect on the rail of the centrifugal force of the counterbalance does not so vary, but varies inversely as the length of the stroke and inversely as the *square* of the diameter of the driving wheel.

From this one concludes that a large wheel is more advantageous to use than a short stroke for one reason at least, and that is that it assists more materially in reducing the effect of the counterbalance on the rail.

The reduction of the power of the cylinder over the wheel might be overcome by an increase of diameter of piston without adding materially to the weight of reciprocating parts, because the amount of material needed to give sufficient dimensions and increase of strength of reciprocating parts to correspond with the increase of cylinder area is less in proportion to the total weight of such parts than the power gained by the increased area is to the total power. This arises from the large amount of material that is used in reciprocating parts for purposes of form, and which remains practically constant for small changes in diameter of piston. This point is not clearly seen without a comparative examination of drawings.

With respect to the percentage of weight of the reciprocating parts to be balanced, there can be but little change made. The mathematics of the matter are well understood and the formulæ are given above. If one engine works well with less balance than another, it merely means that one of them is heavier, and, therefore, that the unbalanced weight does not produce such an appreciable effect on it as on the other engine or that the wheel base is so long that the lateral oscillation of the front end is lessened. If the difference in steadiness is judged simply from the feeling of discomfort of two different engine drivers, as is usually the case, then there is sufficient explanation of the reported differences in the riding of the locomotive to be found in the difference in the susceptibility of different human organisms to jars and shocks. It is noticeable, however, that, in spite of the increase of speed of late years, there has been a decrease in the percentage of weight of the reciprocating parts, which is balanced, and which may be explained by the increase in weight and length of wheel bases of locomotives.

It can now be seen that further mathematical investigation of the subject with reference to locomotives having two outside cylinders is almost sure to be fruitless, but this does not necessarily lead up to a conclusion that nothing can be done to balance locomotives better than they now are, for the reason that there are at least three ways of constructing a better balanced engine, which are easily followed. Two of these methods which meet with objections are an increase in the diameter of the wheel and a decrease in the length of the stroke. The third method, that of decreasing the weight of reciprocating parts, is one which appeals to all as a most advantageous step.

What is sought for is a method of reducing the rail pressure. So far as the methods of balancing are concerned, with two cylinder engines there is but very little new to hope for. Several schemes have been offered which have for their object the balancing of the reciprocating parts by means of other reciprocating bodies of nearly equal weight connected up by levers and rods. Such a plan would never be adopted by any one who looks for simplicity and economy. In the matter of the disposition of the balance in the wheel there can be but little brought out that has not already been mentioned by some authority on the subject. The advantage of placing the balances a little to one side of the point opposite the crank has been well shown by Prof. Gaetano Lanza, of the Massachusetts Institute of Technology, in a paper before the American Society of Mechanical Engineers. This advantage arises from its effect in balancing the turning moment in a horizontal plane caused by the location of the connecting rod and the parts to be balanced in one vertical plane and the counterbalance in the wheel in another vertical plane at considerable distance apart.

February Accidents.

Our record of train accidents in February, given in this number, includes 64 collisions, 55 derailments and 9 other accidents; a total of 128 accidents, in which 53 persons were killed and 180 injured.

These accidents are classified as follows:

COLLISIONS:		
Rear	36	
Butting	20	
Crossing and miscellaneous	8	
		— 64
DERAILMENTS:		
Broken rail	4	
Loose or spread rail	1	
Broken bridge	4	
Detective switch	4	
Broken wheel	1	
Broken axle	3	
Broken truck	1	
Broken car	1	
Loose tire	1	
Misplaced switch	1	
Runaway train	1	
Careless running	1	
Cattle on track	2	
Snow and ice	1	
Washout	2	
Landslide	1	
Malicious obstruction	2	
Purposely misplaced switch	1	
Man on track	1	
Unexplained	22	
		— 55
OTHER ACCIDENTS:		
Broken parallel or connecting rod	2	
Miscellaneous	7	
		— 9
Total number of accidents		128

The causes of collisions, where given, were as follows

	Rear.	Butting.	Crossing and other.	Tot'l.
Trains breaking in two	11	..	..	11
Misplaced switch	3	3	..	6
Failure to give or observe signal	4	2	..	6
Mistake in giving or understanding orders	..	3	..	3
Miscellaneous	12	4	3	19
Unexplained	6	8	5	19
Total	36	20	8	64

A general classification shows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Defects of road	..	13	..	13	10
Defects of equipment	11	7	5	23	18
Negligence in operating	34	3	3	40	31
Unforeseen obstructions	..	10	..	10	7
Unexplained	19	22	1	42	34
Total	64	55	9	128	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Passenger	24	14	6	44	24
Freight and other	95	41	3	139	76
Total	119	55	9	183	100

The casualties may be divided as follows:

KILLED.	Collisions.	Derailments.	Other.	Total.
Employés	27	23	..	50
Passengers	..	..	..	..
Others	2	1	..	3
Total	29	24	..	53
INJURED.				
Employés	55	54	2	111
Passengers	35	27	3	65
Others	4	..	..	4
Total	94	81	5	180

The casualties to passengers and employés, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	..	11	16	23
Defects of equipment	..	3	1	3
Negligence in operating	..	35	27	61
Unforeseen obstructions and maliciousness	..	..	..	14
Unexplained	..	16	6	10
Total	..	65	50	111

Twenty-eight accidents caused the death of one or more persons, and 39 caused injury but not death, leaving 61 (48 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with February of previous years shows:

	1890.	1889.	1888.	1887
Rear collisions	36	29	30	24
Butting "	20	15	21	31
Crossing and other collisions	8	7	6	2
Derailments	55	61	104	67
Other accidents	9	5	13	8
Total "	128	117	174	132
Employés killed	50	20	21	21
Others "	3	3	7	34
Employés injured	111	39	99	51
Others "	69	49	65	55
Passenger trains involved	44	32	70	54
Average per day:				
Accidents	4.57	4.21	5.93	4.71
Killed	1.89	0.82	0.97	1.95
Injured	6.42	3.14	5.66	3.78
Average per accident:				
Killed	0.414	0.195	0 162	0.417
Injured	1.406	0.752	0.953	0.803

Although there were half a dozen very bad accidents in February, we have no record of any passenger killed. The serious trestle accident at Cascade Locks, Or., on the 2d is classed under defects of road, as is our practice in such cases; but there may well be a question whether the responsibility for running over bridges when they are possibly dangerous on account of high water is to be placed wholly on the road department or partly on the operating department. Certainly many of our roads of thin traffic can scarcely afford to watch all bridges at all times, and much must be left to the judgment of the men in charge of trains. As in many cases the best of judgment is of no value, as regards a doubtful bridge, until after a load has been run upon it, locomotive runners

in times of flood have a grave responsibility. The failure of the bridge at Peoria on the 3d was assumed in the newspaper accounts to have resulted from a weak iron tension rod, but we have not yet seen the official report of the State Inspector. The tragic phase so often attending train accidents is vividly suggested by the details of this disaster. One of the other bridge accidents resulted from high water, and another was caused by fire. The rear collision at Newark, N. J., on the 27th, is one which ought to be reported for the benefit of railroad men generally, the same as has been done in the case of that at Winter Hill, referred to below; but New Jersey is not Massachusetts.

Misplaced switches are few this month, but two of the collisions from this cause were fatal ones. In that at Marsh Run, Pa., the rule which was disregarded was a small one, and yet it here meant life and death. As in the Bay View accident, the only way of checking infractions is by constant inspection.

The butting collision at Lockport, N. Y., on the 20th, suggests the desirability of an arrangement of signal lamps on locomotives by which a light of some kind will indicate that no classification signals are being carried. In the case of switch lights every one deems it important to indicate "all right" positively and not by the mere absence of a signal; why should not the same rule apply here? The Michigan Central people, who use no flags or lamps to indicate sections or extras would, however, doubtless say that the proper remedy for this kind of blunder would be the adoption of their practice. The bad collisions at Mitchell, Ind., and Coaling, Ala., are flagrant instances of forgetfulness on the part of both conductor and engineer. The correction of this sort of negligence is one of the most pressing questions before superintendents. A serious collision at Glade Springs, Va., the 8th, is classed as unexplained, but the details given are suggestive. The collision on the Old Colony near Boston on the 25th was at a point which is protected by an automatic electric signal, but it appears from the reports that a switchman deliberately allowed the freight to go upon the passenger train's track, because "he thought that this train, like all the others, would be late that day on account of the fog."

At Lima, O., on the 25th, a Cincinnati, Hamilton & Dayton express train was saved from running on to an undermined bridge by a farmer, who flagged it just in season. On the 12th, a train on the Union Elevated in Brooklyn, N. Y., was run around one of the sharp curves of that road so rapidly as to greatly alarm the passengers. At Kirkwood, N. Y., on the 6th, a passenger was thrown from an Erie express train as he was passing from one car to another, and killed. Near Elkhart, Ind., on the 28th, a three-year-old child, whose parents were asleep, walked out and fell off the platform of a Lake Shore train while it was running at high speed, but escaped uninjured.

Among the accidents in Canada in February were a butting collision near Yarmouth Centre, on the 5th, wrecking 25 cars and killing an engineer; a butting collision of passenger trains on the Canadian Pacific, near Rockliffe, on the 12th, killing an express messenger: and a butting collision on the Michigan Central, near Cayuga, on the night of the 13th, where two heavy freight trains ran together at 30 miles an hour, totally destroying 25 cars. A dispatcher's mistake is given as the cause of the last one.

The rear collision at Winter Hill, Mass., Feb. 25, has been investigated by the Massachusetts Railroad Commissioners, who make a long report. The road is equipped with the Union electric automatic signals, as indicated in our account. The signals bear consecutive odd numbers. The foremost train ran from Boston to Winter Hill at very low speed, owing to the fog and to the fact that some of the signals were found red, having been set by a previous train. The engineer had no difficulty in seeing the signals before his own engine set them, several of them having been standing at "all clear." This train also encountered a torpedo at one point, and the runner is censured for not having come to a full stop. There were board targets at several junctions and crossings, which seem to have led both the engineers to run faster than they otherwise would. The rule requires that a train finding a signal at danger shall come to a full stop. The failure to do this, with the reckless assuming that a signal which could not be seen on account of the fog indicated safety, is made the basis of a severe condemnation of the engineer of the second train, and justly. The engineer asserted at the hearing that he still believed his course to have been right; two of his children had lately died, and the Commissioners express the hope that under other circumstances, with a mind free from grief and anxiety, his judgment and his practice would have been better. This engineer's eyesight was tested, but found good. The conductor and rear brakeman of the foremost train are held not to have violated any specific rule, but the Commissioners say that a fusee should have been dropped. They quote with approval a rule on this point,* and say that it is "well expressed," though the absence of any specified rate of speed and of a definite interval of space would be regarded by most trainmen as a difficulty in the way of exact compliance, especially where the value of fusees used is constantly looked after by a sharp critic. The Board further says:

"The ambiguity of the rules, as developed in the investigation of this accident, calls for immediate attention and correction. Moreover, the rules for the different divisions of the Boston & Maine system should not differ as they now do in substance, in phraseology, or in arrangement. We urgently recommend the adoption of a revised consolidated code, applicable to the whole system, and based on the Time Convention's code."

* "When a train is moving slowly by dark or dusk, or in fog, on the time of a following train, lighted fusees should be dropped upon the track at intervals as long as the rear of the rain is in danger."

It is interesting to note the increasing use of compressed air for various purposes around railroad shops. The number of special tools designed to do work upon engines while upon the repair pits, or which can be placed temporarily upon benches or other places in the shop is fast being increased. Very convenient compressed-air lifting arrangements for wheels and other moderate weights are in use in loading and unloading cars. We have recently noticed a novel adaptation of compressed air to elevating sand for engine use from the dryer to the distributing bin overhead. The sand, after being dried in a hopper dryer, surrounding a stove, falls through a fine grating, which holds back any gravel, into a hopper, which in turn is attached to the upper portion of the casing of a 2-in. globe valve from which the valve proper has been removed. From one side of the valve globe starts horizontally a 2-in. pipe, which, by a curve of 2-ft. radius, assumes a vertical direction, and by another bend at the top points into the sand bin, some 40 ft. over the basement, in which the feeding hopper is.

At the other side of the globe a ½-in. pipe is connected, its opening being contracted by a ⅛-in. nipple. The sand feeds into the globular chamber, when compressed air at 50 lbs. to the inch is let in through the small pipe. This, passing through the orifice in the nipple, forces the sand through the vertical 2-in. pipe into the bin above. The apparatus elevates from one to two car-loads of sand per day, and one man brings the sand to the dryers, keeps up the fire, watches the elevator, and does other work between times. Contrary to what might seem the natural wearing action of the sand under the circumstances, the bent portion of the pipe is not where the wear comes. It is in the first foot after leaving the valve, and this part wears out about once in three weeks and is replaced when necessary. The whole device seems very efficient and simple

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A Chicago dispatch of Tuesday says:

The vigorous protest of the suburban residents against the action of the railroad companies in reducing the speed of all trains to 10 miles an hour inside the city limits, in compliance with the ordinance, has had its effect. The City Council passed a new ordinance last night. It divides the city into three districts. Within the first district passenger trains are allowed to run 20 miles an hour; in the second 25 miles, and in the third 35 miles an hour. The roads are required to build on each side of their rights of way substantial walls or fences of such material, size and design, and within such period, as the Mayor and Commissioner of Public Works may designate, and to erect and maintain gates and signal bells at such crossings as shall be designated by the authorities. No road is allowed to take advantage of the ordinance until it complies with its provisions. Railroads failing to do this are to be governed by the old 10-mile ordinance.

Probably the best and most feasible compromise for all concerned would be secured by the adoption of a scheme on the basis here outlined. It would afford no relief for those portions of several important roads which lie along the middle of a street for many blocks, where fences and gates are impracticable, but the application of city restrictions to the open country 10 miles out can, under the new ordinance, be quickly done away with. The city is now about 20 miles long, from north to south, and we understand that some of the roads were obliged to put on additional trains, the slow rate of speed preventing the number of trips for which the equipment was heretofore available. This constitutes a considerable tax upon a business which is not directly very profitable. It is stated that during 1889 one of the roads entering Chicago paid on account of personal injuries alone nearly 11 per cent. of the gross revenue received on account of suburban traffic, and that without any particularly aggravated cases of injury.

Last week we mentioned the fact that the Chicago, Burlington & Quincy had given an order for 6,750 sets of the Westinghouse quick-acting freight brake. In the same paragraph we said that about 1,200 of the freight cars of the Chicago, Burlington & Quincy were already equipped with the air brake. We are informed that up to Jan. 1, 1890, the Westinghouse brake had been applied to 2,657 freight cars on that road. Therefore, about 47 per cent. of the total freight equipment of the road will soon be supplied with the air brake instead of 40 per cent., as we stated last week. We are also informed that this order for air brake equipment will be followed up very soon with an order for automatic couplers for 6,750 cars. Foundation gear, suitable for the Westinghouse brake, is applied to all new cars of the Chicago, Burlington & Quincy, and all cars sent to the shops for general repairs.

The field for air-braked freight cars is not confined to the carriage of oranges on the trees, or $5,000 race-horses, or oysters for Chicago epicures, or other property that will spoil if delayed; neither are their advantages confined to the railroad companies which will save money and the trainmen whose lives will be safer. Things far more prosaic are already enjoying their benefits. At Wheeling, W. Va., a dealer in the very "slow" commodity of flour recently sold nine carloads a little sooner than he had expected and found his stores suddenly empty; but by arrangement with the Baltimore & Ohio he had two carloads brought from Chicago by passenger train, and the housewives of Wheeling were dealing it out in the form of hot cakes in 24 hours from the time it left the Lake City. Of course, this could not have been reasonably done without air-braked cars.

The most durable wooden ties of which we have been able to obtain any information are those in use upon the Panama road, made from lignum-vitæ, and which have been in since the construction of the road, some 35 years since It takes about 20 years, we are informed, before the rail makes any appreciable bedding into the tie. These ties can be replaced along the line of the road for $1.80 each, but the management is using more or less steel ties similar to those in use on the Mexican Railway, and which can be furnished at a little lower figure.

At last Tuesday's meeting of the Western Railway Club the report of the Committee on the Publication of the Proceedings was accepted with some minor amendments in the form published. There was little or no opposition on the part of the railroad men themselves. The strongest opposition was met from a representative of one of the Western railroad journals. In consequence of this action of the Club the proceedings will not be given out for publication until they have been revised and published by the Club. Our readers will remember that we have from the first favored this plan.

NEW PUBLICATIONS.

The *Electrical Engineer*.—This journal has been published some years as a monthly and has made an excellent reputation as a high-class technical journal. It is now to appear weekly, the first weekly issue to be out April 2. It is the purpose to enlarge the field covered, without lowering the scientific standard of the journal. Mr. T. C. Martin, Past President American Institute of Electrical Engineers, and Mr. Joseph Wetzler, one of the managers of the Institute, have taken editorial charge. These gentlemen have been for some years editors of the *Electrical World*, and to their excellent, untiring and loyal work very much of its success is due. They will take the same qualities to their new field, and we have no doubt that there, too, they will win success.

TECHNICAL.

The Detroit River Bridge.

A bill has been favorably reported by the Railway Committee of the Canadian House of Commons to renew the charter of the Detroit River Bridge Company. The old charter authorizes the construction of a winter bridge, with draws to remain open in the summer. In the new bill the company asks authority to construct a high level bridge, and it is proposed to have a main span 1,065 ft. long, and two flanking spans 750 ft. long, with 140 ft. clearance above high water.

Car Heating.

The Williames system of car heating, which, as is well known, is a return system, has been applied on the passenger cars of the Cincinnati, Sandusky & Cleveland. Cars on that road have been running with this system since Feb. 1, with, as we are informed, complete success, except that the coupling for a time gave some trouble. It is now, however, entirely satisfactory. The prominent features are the use of the return system, automatic regulation of the temperature and complete ventilation.

The Hudson River Bridge.

The House Committee on Commerce will report favorably Mr. McAdoo's bill for the construction of a bridge across the North River. The incorporators of the North River Bridge Co. are Jordan L. Mott, W. A. Roebling, Charles J. Canda and others. Amendments made in committee allow the Interstate Commerce Commission to fix the dividends that may be paid upon the capital stock and fix the minimum height of the bridge at 135 ft., with the proviso that the Secretary of War may increase this requirement to 145 ft.

St. Lawrence Canals.

Sir John Macdonald, in a recent interview with a large deputation of leading men from all parts of the Dominion, promised that the entire system of St. Lawrence canals will be deepened 14 ft. within three years.

The New Orleans Bridge.

Mr. T. C. Clarke has presented to the House Committee on Commerce a memorandum on the proposed bridge of the New Orleans Terminal & Bridge Co. He is of the opinion that the bridge should be below the city rather than above, for the reasons that the commerce coming to New Orleans from above is of 50 per cent. greater value than that coming from below, and is increasing fast. Also, it is much more difficult to handle the class of vessels coming in from above than those coming from below. Therefore it would be necessary to have a longer span above the city than below. He considers that for a bridge above the city the centre span should be not less than 1,000 ft., while below it might be 770 ft., or even less. He suggests that the clear height be 140 ft., which will pass 90 per cent. of all vessels with masts. He would not object, however, to a greater height if necessary. His proposition is to reach to level of the bridge by rack railroads.

Chicago Elevated Roads.

Progress on the "Alley" elevated road in Chicago is being made in a way that indicates good management, and determination to have the road running this year. South of Twenty-ninth street the structure is being rapidly erected as far as Thirty-seventh street. A local paper says: "The road's right of way consists of 25 ft. on the State street side of the alley extending between

Thirty-first and Thirty-seventh streets, and thence in a straight line in either direction. Portions of this acquired space look like pictures of Metz after the siege. Houses have been torn down, moved, shaved off, or clipped of their wings at pleasure. A mile of the road is to be completed by March 26, and clearing work must be sacrificed to that of building. There are to be stations at distances of two blocks in the section now being constructed, and at such points cross girders are placed to connect with the platforms and the depots thereon, after the plan adopted in New York. The foundations are of Louisville cement, upon which are placed side by side two large stones with four anchoring rods, which run upward through a brick pier six feet in height, with a heavy cope-stone at the top. An iron casting supports the post, and is bolted down by the anchoring rods. The distance from the surface to the bottom of the foundation is just 10 ft."

Canal Construction.

Tenders will be called for shortly by the Canadian government for enlarging and deepening the Rapide du Plat Canal at Morrisburg, Ont. The work may be unusually heavy, as the north bank is generally high and that on the south side is for the most part close to the rapids, and so formed that it is difficult to interfere with it. Consequently long hauls and double handling of the material to be removed in widening and deepening will be necessary. The shoal inlet or bay opposite the eastern part of Morrisburg can perhaps be used for depositing the excavated material, and it could afterwards be used for mills or wharves. To admit of this the logs, lumber, etc., of an old sawmill will have to be removed.

THE SCRAP HEAP.

Notes.

The Fontaine automatic time signal is being tried on the New York Central near Spuyten Duyvil.

The Canadian Pacific has just made contracts for 85,000 tons of coal from the mines at Sydney, C. B., Louisburg and Caledonia.

The apparatus for working the block system is ready for use on the Erie between Port Jervis and Lackawaxen, on the Delaware division. The signals are about 2½ miles apart.

The Richmond & Danville (Georgia Pacific) now runs through passenger trains between Atlanta Ga., and Arkansas City, Ark., 481 miles, by way of the Louisville, New Orleans & Texas.

The employés of the Iowa Central machine shops at Marshalltown, Ia., struck, on March 10, because of a rule prescribing that extra time on nights and Sundays should be counted only at regular rates.

The new directors of the Louisville, New Albany & Chicago state that neither the Pennsylvania nor the Louisville & Nashville has secured control of the road; but it is added that friendly relations will be maintained with both of those companies.

It is reported that the New York Central and Michigan Central are to run a through passenger train between New York and Chicago the coming summer, which will make the time between the two cities in about 23 hours, which is two hours less than the shortest time now made by any line.

Press dispatches state that the New York Central passenger conductors who have been running through between New York and Buffalo, 429 miles, have found the trips too hard for them, and that the runs are to be divided. The men on the two fastest runs will, however, continue to run through. These trains make the trip in about 10¾ hours.

After some delay, the contract for completing the large hotel to be built by the Northern Pacific & Manitoba at Winnipeg has been awarded to Rourke & Case, who built the general offices, round-house, workshops, etc., last year. The contract price for the superstructure of the hotel is $205,000. Work will be commenced as soon as the weather will permit.

A New York Central freight train was attacked by a dozen thieves while standing on a side track near Dutchess Junction, N. Y., one night last week. The robbers approached by a boat on the Hudson River, the side track being close to the water, but they were met, fired upon and repulsed by a detective of the road who was on board the train watching for them.

On Friday last a large rock rolled down the mountain side and fell upon the track of the West Virginia Central in a cut near Blaine, 40 miles west of Cumberland, Md. A work train with 12 men was sent to remove the obstacle. While the men were working a mass of earth rushed down the mountain side, burying seven men. Two were taken out dead, one has since died, and three others were dangerously if not fatally injured.

Bridge Failures.

A trestle 50 ft. high on the Georgia Pacific Division of the Richmond & Danville, near Horse Creek Mines, Ala., was wrecked by a derailed freight train March 13, and the whole structure, together with 12 cars, was burned up. One trainman was killed and four were injured.

The Louisville & Nashville bridge, 11 miles north of Nashville, was undermined by high water and fell just after a passenger train had passed it on March 10.

An iron bridge several hundred feet long on the Natchez, Jackson & Columbus road, near Jackson, Miss., was carried away by flood on the night of March 13.

Two men were drowned at Glen Falls, N. Y., March 15, by the fall of an old highway bridge in course of demolition.

A bridge of the LittleRock & Fort Smith over the Mulberry River was carried away March 11, and the St. Louis, Iron Mountain & Southern road lost bridges north of Little Rock. The St. Louis, Arkansas & Texas suffered similarly north of Pine Bluff, Ark., but reports are indefinite.

Land Slides in Oregon.

As a result of the landslides and washouts of the Oregon line of the Southern Pacific it is said that about three miles of entirely new road will have to be built around a piece of track, which is buried 30 ft. deep under earth and water.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Buffalo & Southwestern, 6 per cent. on the preferred stock, payable March 10.

Chicago, Milwaukee & St. Paul, 3½ per cent. on the preferred stock, payable April 16.

Lehigh Valley, quarterly, 1¼ per cent., payable April 15.

Sunbury & Lewistown, semi-annual, 4 per cent., payable April 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allegheny Valley, annual, Pittsburgh, Pa., April 8.

Chicago & Alton, annual, Chicago, Ill., April 7.

Chicago, St. Louis & Pittsburgh, annual, Union Depot, Indianapolis, Ind., April 9.

Dallas Terminal, annual, Cockrell Building, 825 Main street, Dallas, Tex., April 5.

East Tennessee, Virginia & Georgia, special, Knoxville, Tenn., April 15.

Hocking & Western, special, Pickaway House, Circleville, O., March 30, to vote upon a proposed increase of stock and issue of bonds.

Joliet & Chicago, annual, Chicago, Ill., April 7.

Kansas City, Fort Scott & Memphis, annual, Kansas City, Mo., March 24.

New York Central & Hudson River, annual, Grand Central Station, New York City, April 16.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Car Builders' Association* will hold its next annual convention at Old Point Comfort, Va., June 10. Rooms should be secured of Mr. F. N. Pike, manager, Hygeia Hotel, Fortress Monroe, Va.

The Master Mechanics' Association will hold its next annual convention at Chattanooga, Tenn., in June.

The *New England Roadmasters' Association* will hold its eighth annual meeting at Boston, Mass., Aug. 20 and 21.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Saturday following the second Wednesday of each month at 7:30 p. m. in the director's room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Car Accountants' Association.

The Committee on Discussion, of the National Association of Car Accountants, has issued a circular asking members to prepare papers for presentation at the June meeting. A list of subjects is given embracing the usual topics heretofore considered by this association. Answers should be sent to Edmund Yardley, Chairman, Pittsburgh, Pa., by April 15.

Civil Engineers' Club of Cleveland.

The annual meeting was held March 11, President W. R. Warner, in the chair. Messrs. Ralph A. Harmon and Hiram Kimball, both of the Cleveland City Forge & Iron Co., were elected active members. The application of Mr. Harvey Fitch Coleman, of the King Iron Bridge & Mfg. Co., for active membership was favorably reported. Mr. Searles, Chairman of the Banquet Committee, made a report on the arrangements for the approaching banquet. Reports were presented on the progress in engineering for the year by the chairmen of the different committees, as follows: On Civil Engineering and Surveying, C. G. Force, Jr.; on Railroad Engineering, A. Mordecai; on Architecture, J. N. Richardson; also on Mechanical Engineering, read for the Chairman of that Committee by Mr. Walter Miller. The President presented the annual report of the Executive Board, accompanied by the annual reports of the Treasurer, S. J. Baker, and of the Secretary, C. O. Palmer. On motion, the reports were accepted.

The ballot for officers resulted in the election of Mr. W. H. Searles, for President; Mr. J. L. Gobeille, Vice-President; Mr. C. O. Palmer, Secretary; Mr. S. J. Baker, Corresponding Secretary; Mr. N. P. Bowler, Treasurer; Mr. C. M. Barber, Librarian, and Prof. Cady Staley, member Board of Managers of the Association of Engineering Societies.

Short speeches were made by the newly-elected officers, and also by Messrs. Swasey, Leland, Eisenmann and others. By invitation of the President the club was addressed briefly by Mr. G. W. G. Ferris, of Pittsburgh, and Col. Wm. H. Paine, of New York.

Engineers' Club.

The last of the series of 12 informal dinners of this club, which have been held during the winter, took place at the house of the Club in New York City on the evening of March 13. These dinners have been extremely successful in accomplishing what was their original purpose—that is, in bringing together a large number of men in an informal and social way. Latterly the dinners have been attended by as many as 60 people. It is apparent that the club has already outgrown some parts of its commodious and comfortable house, and a movement is on foot to secure a larger house.

Engineers' Club of Philadelphia.

A regular meeting was held March 1, 1890, President H. W. Spangler in the chair; 16 members and two visitors present.

The secretary presented, for Mr. Howard Constable, an illustrated paper on the re-enforcement or underpinning of the iron piles of a drawbridge pier.

Mr. Barton H. Coffey presented a paper on the purifying effect of sand filtration.

There was some discussion. Mr. Howard Murphy expressed the opinion that some day we would have to adopt a separate system of water supply, furnishing the very small quantity of water required for strictly personal, domestic and similar uses, from pure sources, and the immense quantities required for manufacturing and general uses from sources not capable of yielding potable water.

Mr. Henry G. Morris described a new method of sinking dies, exhibiting a beautiful specimen of the results accomplished. He stated that a result could be obtained by this process at a cost entirely insignificant when compared with cost by the old method.

Toronto Engineering Society.

The regular meeting of this society was held in the School of Practical Science at Toronto last week. T. S. Russell read a paper on railroad construction and surveying, illustrating it with photographs and profiles of the work as carried on under his charge in Manitoba last summer. He described a machine for excavating and embanking earth, which, though it does its work very quickly, he considered open to serious objections on account of the loose manner in which it throws up the dirt. An ingenious method of determining the dump in earthwork and other details were described.

PERSONAL.

—Mr. W. J. McMullen, Roadmaster of the Mason City & Fort Dodge, died at Mason City, Ia., March 9.

—Mr. R. E. Mims, formerly Paymaster, but for the last two years Auditor of Receipts, of the Central of Georgia, has resigned to engage in business in Atlanta.

—Pittsburgh papers announce the resignation of Mr. Elliott Holbrook, General Superintendent of the Pittsburgh & Lake Erie. He has held the position since July, 1887.

—Mr. John M. Davison, for many years President of the Saratoga & Whitehall, now a part of the Delaware & Hudson system, died in Saratoga, N. Y., recently, aged 74 years.

—Mr. Millard Hunisker has resigned his position as Assistant Secretary and General Agent of the Carbon Iron Co., of Pittsburgh. His address for the present will be "care Duquesne Club," Pittsburgh, Pa.

—Mr. J. M. Lowry, formerly Master Mechanic but lately Consulting Engineer of the mechanical department of the Chicago, Milwaukee & St. Paul, died suddenly in Milwaukee, March 4.

—Mr. E. P. Vining, lately Traffic Manager of the New York & New England, was last week appointed Assistant General Manager of the St. Louis & San Francisco, with charge of the traffic department of the company.

—Mr. V. W. Gaskill, Secretary of the California Railroad Commission, has resigned to become United States Deputy Surveyor at San Francisco. Mr. James V. Kelly, of Santa Clara, has been appointed to succeed him.

—Mr H. R. Dill, who recently resigned as Superintendent of the Huntington division of the Chesapeake & Ohio, has been appointed Superintendent of the Main Stem division of the Central of Georgia, to succeed Mr. Levi Hege, resigned.

—Mr. William Golden, of Cornwall, N. Y., a railroad contractor, who had charge of repairs to the West Point tunnel, on the West Shore, after it caved in, was killed on Friday last. His body was found on the tracks of the West Shore, in Newburg, the next morning, having been run over by a train.

—Mr. Frank C. Benham, formerly Superintendent of Transportation of the Valley (Ohio) road, and A. R. Gibson, Freight Agent of the same road, have resigned, and in connection with Mr. W. R. Huntington have organized the Huntington Coal Co.

—Mr. W. L. Findley has been elected President of the Dunham Mfg. Co., and Mr. Arthur Crandall, well known in Chicago and the Northwest as a representative of this company, has been elected Secretary, with headquarters at the Chicago office, 703 Phenix Building.

—Mr. F. A. Hill has resigned as Superintendent of Construction and Chief Engineer of the Seattle & Northern, to give attention to his private affairs. Mr. L. C. Roberts, recently foreman of the machine shops of the Columbia & Puget Sound, has been appointed to succeed Mr. Hill.

—Mr. R. B. Starbuck, Trainmaster of the Fort Wayne, Cincinnati & Louisville has been appointed Superintendent of the Peoria, Decatur & Evansville Road. Mr. Starbuck was formerly connected with the Cleveland, Columbus, Cincinnati & Indianapolis, and with the Cincinnati, Hamilton & Dayton.

—Mr. Sol Haas, who has been General Traffic Manager of the Associated Railways of Virginia and the Carolinas since the association was formed in 1880, has resigned that position to devote his entire time to the Richmond & Danville. Mr. R. D. Carpenter will suc-

ceed Mr. Haas on the Associated roads, with the title of Commissioner.

—Mr. J. S. Lane, Roadmaster of the Hartford division of the New York, New Haven & Hartford, resigns his position, to take effect April 1, after 33 years of continuous track service, except three years during the civil war. For 26 years he has been a roadmaster. He has leased a trap-rock quarry near Meriden, Conn., bought a stone-crushing plant and will hereafter devote himself to making macadam highways.

—Major George D. Lawrence, Manager of the Rome & Decatur since last June, has been appointed Superintendent of the New Orleans Division of the Louisville, New Orleans & Texas, to succeed Mr. A. A. Sharp, resigned. Major Lawrence was formerly connected with the Chattanooga, Rome & Columbus as Superintendent and for a short time with the East Tennessee, Virginia & Georgia as General Agent. Mr. Sharp has been connected with the road since 1882 as Superintendent of Construction, Superintendent of Transportation and Division Superintendent.

—Mr. O. W. Potter, Chairman of the Board of Directors of the Illinois Steel Co. since its organization, has resigned and intends to sail for Europe for a long rest. Mr. Potter was President of the North Chicago Rolling Mill Co. before its consolidation with the Illinois Steel Co., and was connected with it for 33 years. Mr. Potter's son, Mr. Edwin C. Potter, has resigned as a director of the Illinois Steel Co. and will accompany his father abroad. Mr. E C. Potter will devote part of his time to the study of the manufacture of tin plate.

—Mr. T. A. Mac Kinnon, General Superintendent of the Ontario & Atlantic divisions of the Canadian Pacific, has been appointed Manager of Transportation of the road. In 1868 Mr. Mac Kinnon became a clerk and timekeeper of the Passumpsic road, in Vermont, and remained with that line until 1873, when he was appointed Superintendent of the Brockville & Ottawa and Canada Central roads. In 1880 he was appointed Assistant General Manager, and three years later General Manager of the Southeastern, now controlled by the Canadian Pacific.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—A. P. Wilder, Car Accountant, having been assigned to other duties, the office of Car Accountant has been abolished, and the duties will devolve upon the Car Service Superintendent.

Atlanta & Charlotte.—At a meeting in New York last week the following directors were elected: Eugene Kelly, President; P. P. Dickinson, James H. Young, Richard Irwin, R. H. Rochester, H. W. Sibley, Joseph Bryan, R. R. McAlpine, S. Wilmer, C. S. Fairchild, Charles M. Frye and Michael Jenkins.

Baltimore & Ohio Southwestern.—Edward Evans, of Chillicothe, Ohio, has been appointed Division Master Mechanic of the road.

Burlington & Missouri River.—G. P. Smith, who has been Resident Engineer on the Southern division, with headquarters at Wymore, Neb., has been transferred to the Northern division for the present, with headquarters at Lincoln.

Canadian Pacific.—T. A. Mackinnon has been appointed Manager of Transportation, and will have general charge of all matters relating to train and station service, with office at Montreal. Thomas Tait has been appointed General Superintendent of the Ontario and Atlantic divisions in place of Mr. Mackinnon. The headquarters of the Ontario and Atlantic divisions will hereafter be at Toronto.

Central of Georgia.—R. H. Dill has been appointed Superintendent of the Main Stem Division, with office at Macon, Ga., to succeed Levi Hege, resigned.

James H. Storey, Assistant Trainmaster, has been appointed Trainmaster of the main stem, with headquarters at Macon, Ga., to succeed J. M. Phillips, resigned.

Charleston, Sumter & Northern.—C. L. Martin, lately Auditor of the Rome, Watertown & Ogdensburg, has accepted the same office with this road, with headquarters at Sumter, S. C.

Chicago, Rock Island & Pacific.—The company announces the following changes to take effect April 1: George F. Lee, appointed City Passenger Agent at Chicago, vice W. W. Foltz, resigned; W. H. Firth, appointed General Agent, Passenger Department, Denver, Col., vice George F. Lee, transferred; C. B. Sloat, appointed Traveling Passenger Agent for the Southwest, with headquarters at Kansas City, vice W. H. Firth, transferred; W. H. Wishart, appointed Traveling Passenger Agent in Kansas and Nebraska, with headquarters at Topeka, Kan , vice C. B. Sloat, transferred.

Cincinnati & West Virginia.—The following are the directors of this Ohio company: William Brockie, Henry C. Gibson, Henry M. Hoyt, Jr., Henry Lewis, Samuel Hunt, Thomas D. Rhodes, John B. Keys and Howard C. Hollister. The address of the last five is Cincinnati.

Cleveland, Cincinnati, Chicago & St. Louis.—The Cairo, Vincennes & Chicago and the Ohio, Indiana & Western are now respectively operated as the Cairo Division and the Peoria Division, and the jurisdiction of the general officers has been extended over those roads: J. J. Fletcher, with the title of Assistant General Freight & Passenger Agent, with headquarters at Cairo, Ill., will have immediate charge of the freight and passenger traffic of the Cairo Division. Ford Woods, with the title of Assistant General Freight Agent, and H. M. Bronson, with the title of Assistant General Passenger Agent, with headquarters at Indianapolis, will have immediate charge, respectively, of the freight and passenger traffic of the Peoria Division. T. H. Noonan has been appointed Assistant General Freight Agent, with headquarters at Chicago, Ill., with jurisdiction over the business originating at that point and beyond, moved east-bound via Chicago.

George W. Bender, Superintendent of the Chicago Division, will have direct supervision over the terminals at Cincinnati.

J. Q. Van Winkle, Superintendent of the St. Louis and Indianapolis divisions, will have direct charge over the terminals at Indianapolis, including Brightwood, West Side, Belt and North Indianapolis yards.

Columbia & Puget Sound.—A. Browne, Trainmaster, has been appointed Assistant Superintendent, with office at Seattle, to succeed Cristopher Miller, resigned.

Columbus, Hocking Valley & Toledo.—The offices of Superintendent of Telegraph and Car Service Agent have been abolished and the duties will be assumed by the Superintendents. E. A. Wright, who has been filling the positions thus abolished, will remain in the service of the company as a Train Dispatcher.

Coronado Beach.—W. W. Wordie, Chief Clerk in the Auditor's office of the Southern California, has resigned to accept the position of General Manager of this road.

Dallas, Pacific & Southeastern.—At the recent annual meeting the stockholders elected J. E. Henderson, President: W. H. Flippen, Treasurer, and J. P. Murphy, Secretary, and the old board of directors: A. Sanger, J. C. O'Connor, J. N. Simpson, D. H. Morrow, W. H. Flippen, B. Blankenship, J. P. Murphy and R. N. McLaurin.

Dover & Statesboro.—Frank W. Scofield, lately Superintendent of the Augusta, Gibson & Sandersville, has been elected General Manager of the Savannah, Dover & Statesboro.

Dubuque & Sioux City.—The annual meeting of the road was held at Dubuque, Ia., March 18. Out of a total of 80,000 shares of stock, 78,736 were represented. Stuyvesant Fish, of Chicago; E. H. Harriman, John Arthon, S. V. R. Cruger, H. F. Webster, W. D. Guthrie and T. H. Gibson, New York; E. C. Woodruff, Elizabeth, N. J.; A. S. Garretson and James F. Leavy, Sioux City; S. L. Daws, Cedar Rapids; W. J. Knight, M. M. Walker, J. V. Riner and John T. Hancock, of Dubuque, were elected directors.

Duluth & Iron Range.—George C. Kimball, lately Vice-President of the Chicago & Eastern Illinois, has been appointed Vice President and General Manager of this road.

East Line & Red River.—W. M. Giles, of Mineola Tex., has been appointed Receiver of this Texas road.

Fall River, Warren & Providence.—At the recent annual meeting the following were elected directors: Charles F. Choate, of Southboro; F. L. Ames, of Easton, Thomas J. Borden and John S. Brayton, of Fall River, Thomas Dunn, of Newport, and W. R. Turner, of Randolph.

Haines Brackett, Fort Clark & Rio Grande.—The following officers have been elected: Charles D. Haines, Kinderhook, N. Y.: Vice-President, Fred. Mahon; Secretary, I. L. Marton, of Brackett, Tex., and Treasurer and General Manager, Elmer T. Haines, Brackett.

Haines Medina Valley.—The officers of this Texas road are: President, Mrs. Charles D. Haines; Vice-President, T. M. Paschal; Secretary, E. de Montell; Treasurer, Joseph Courand, and Chief Engineer, David S. Haines, Castroville, Tex.

Homer & Carnesville.—These officers have been elected: President, Madison Bruce; First Vice-President, Lemuel N. Tribble; Second Vice President, Thomas F. Hill; Treasurer, P. F. Farr, and Secretary, P. M. Edwards.

Jacksonville, Tampa & Key West.—J. A. Larnard having resigned the position of Superintendent, until further notice, the duties of the office will be assumed by C. O. Parker, Assistant General Manager, who will continue to exercise general supervisory authority over the operation of the mechanical, road and transportation interests of all lines in the system.

Kansas City, Clinton & Springfield.—These directors were elected at a meeting in Kansas City last week: George H. Nettleton, J. S. Ford, Wallace Pratt, J. H. Emmert, W. W. Fagan, I. P. Dana, M. L. Sargent, W. E. Dunn, W. J. Ferry, all of Kansas City.

Kansas City, Fort Scott & Memphis.—The following directors were elected at the annual meeting in Kansas City, March 12: George H. Nettleton, J. S. Ford, J. H. Emmert, I. P. Dana, W. E. Dunn, Kansas City; H. H. Hunnewell, Nathaniel Thayer, Charles Merriam, Francis Bartlett, C. W. Courtright, Boston; C. W. Blair, Leavenworth, Kas.; B. P. McDonald, Fort Scott, Kas.; O. E. Learnard, Lawrence, Kas.

Lake Side & Marblehead.—W. M. Harsh has been appointed Superintendent of the road, to succeed J. W. Wardwell, resigned.

Learenworth & St. Joseph.—The incorporators of this 33-mile Missouri road, referred to last week, are: A. B. Stickney, Ansel Oppenheim, C. W. Benson, Francis Skywith and Raymond Dupuy, all of St. Paul, Minn.

Louisville Southern.—C. J. Ranahan, of New Albany, Ind., has been appointed Master Mechanic of the road, with office at Louisville, Ky.

Mexican Central.—S. O. Lewis, Superintendent of the first and second division, has been granted a four month's leave of absence on account of sickness, and E. E. Styner has been appointed Acting Superintendent during his absence.

Mexican National.—E. V. Sedgwick has been appointed Master Mechanic, with headquarters at San Luis Potosi, Mex.

Missouri River, North Platte & Denver.—The names and addresses of the officers of this company are as follows: President, Loran Clark, Albion, Neb.; Vice-President, T. C. Patterson, North Platte, Neb.; Treasurer, T. J. Foley, North Platte, Neb.; Secretary, F. H. Smith, Albion, Neb., and Chief Engineer, J. W. Andrews, Fremont, Neb.

Montreal & Sorel.—The annual meeting of the company was held at the offices in Montreal recently and the following were elected directors: C. N. Armstrong, T. T. Turnbull, M. S. Lonergan, R. Prefontaine, M. P., and J. F. Armstrong. At a subsequent meeting of the directors, C. N. Armstrong was elected President; T. T. Turnbull, Vice-President, and R. Watson, Secretary.

New York & New England.—J. B. Henrey, Superintendent of Motive Power, having resigned, Albert Griggs, formerly Superintendent of Locomotives, and of the car department of the Providence & Worcester division of the New York, Providence & Boston, has been appointed to succeed him.

New York & Northern.—W. D. Davies having resigned the position of General Freight and Passenger Agent, that office has been abolished. The duties heretofore discharged by the General Freight and Passenger Agent will be assumed by the General Superintendent.

L. M. Allen, in addition to his duties as Agent at Pier 40, East River, has been appointed Assistant General Freight Agent, with office at Pier 40, East River, New York, and reporting to the General Superintendent.

Paducah, Nashville & Charleston.—The incorporators of this Kentucky road are: Benton McMillen, J. E. Washington, W. J. Stone, J. R. Hendricks, J. J. Nall, H. B. Lion, Charles Reed, Thomas H. Puryear, W. W. Powell, E. P. Noble, George C. Wallace, Warren W. Martin, J. L. James, Jr., J. F. Foard, T. T. Hillman and Myer Weil, of Paducah, Ky.

Pecos River.—J. J. Hagerman, of Colorado Springs, Colo.: C. B. Eddy, W. A. Hawkins and E. G. Shields, of Eddy, N. M.; James C. O'Connor, of Dallas, Tex., and E. B. Bronson, Harold Brown and W. H. Austin, of El Paso, Tex., are the incorporators named in the Texas charter of this company, which, as recently noted, has been incorporated in New Mexico as the Pecos Valley.

Pennsylvania Co.—The offices of Superintendents of Transportation have been abolished. Instructions in regard to the movement and distribution of cars will be issued from the office of the General Superintendent of Transportation. This abolishes the offices of Superintendent of Transportation of the Chicago, St. Louis & Pittsburgh, and Pittsburgh, Cincinnati & St. Louis, held by S. H. Church, of Columbus, and Superintendent of Transportation of the Pennsylvania Co., held by Edmund Yardley, of Pittsburgh. These officers have been transferred to the general offices at Pittsburgh.

Pennsylvania, Poughkeepsie & Boston.—C. E. Mack, Chief Clerk of the Freight Department of the Philadelphia & Reading, has been appointed General Freight and Passenger Agent, with office in Philadelphia, to succeed E. J. Fallon. The offices of all officers except General Superintendent have been removed to 411 Walnut street, Philadelphia.

Peoria, Decatur & Evansville.—R. B. Starbuck, Trainmaster of the Fort Wayne, Cincinnati & Louisville, has been appointed Superintendent of this road, with office at Peoria. He was formerly Train Dispatcher on the Cincinnati, Hamilton & Dayton.

Pittsburgh Junction.—At the annual meeting last week, these officers were elected: President, Thomas M. King; Directors, John W. Chalfant, C. B. Herron, H. W. Oliver, Jacob Painter, Jr., Reuben Miller, William Metcalf, W. L. Vankirk, William Vankirk, A. E. W. Painter, C. L. Fitzhugh, Charles F. Mayer and William Frick.

Port Townsend Southern.—The stockholders of the company have elected the following directors: Elijah Smith, Prosper W. Smith, James H. Benedict, of New York City; Thomas Jackaman, Chas. Eisenbeis, of Port Townsend, Wash.; J. C. Haines and W. H. McNeil, of Seattle. Elijah Smith is President, and H. W. McNeil Vice-President.

St. Louis, Arkansas & Texas.—W. T. Smetten, Trainmaster of the Texas Division, has been appointed Division Superintendent, with office at Pine Bluff, Ark., to succeed T. W. Kennon, resigned, to accept service with another company.

St. Louis, Chester & Grand Tower.—The incorporators of this Illinois road are: S. Dwight Eaton, Burlington, Ia.; H. M. Pollard, St. Louis; William Barrett, Chicago; Thomas M. Chase and M. C. Brown, East St. Louis.

St. Louis Merchants' Bridge & Terminal Co.—G. E. Cain, formerly Roadmaster of the Wabash, has been appointed General Roadmaster of this company.

St. Louis & San Francisco.—E. P. Vining has been appointed Assistant General Manager and assigned to duty in charge of the traffic department.

Sea Side & Brooklyn Bridge Elevated.—The following directors and officers have been elected: President, Simon Uhlmann; Vice-President, Reuben T. Pollard; Secretary, John W. Mitchell; Treasurer, Hugo Rothschild. Directors: Simon Uhlmann, Frederick Uhlmann, Hugo Rothschild, W. N. Cohen, Reuben T. Pollard, Wm. B. Longyear, Frederick Martin, John W. Mitchell, A. A. Leavey, J. N. Kaufmann, Otto Ladenburg, Frederick K. Winslow and Edward L. Foster.

Tacoma Belt.—The articles of incorporation have been filed by William H. Cushman, George P. Eaton, Fremont S. Harmon, Elisha S. Callender, Eben Pierce, Allan B. Graham, Charles W. Whedon, Frank D. Nash and William A. Sternberg, of Tacoma, Wash., and Henry A. Strong, of Rochester, N. Y.

Toledo, Findlay & Springfield.—E. C. Law has been appointed General Freight Agent, with headquarters at Toledo. He has heretofore been Contracting Agent of the Toledo, St. Louis and Kansas City, with headquarters at Detroit.

Toledo, St. Louis & Kansas City.—James Sloan, formerly General Roadmaster of the Chicago & Eastern Illinois, has been appointed to a similar position on the Western Division of this road.

Union Pacific.—Robert Baxter, Assistant Superintendent of the Wyoming Division, with office at Cheyenne, has been appointed Superintendent to succeed W. L. Ryder, who has been appointed Superintendent of the Idaho Division, with office at Pocatello. F. L. Corwin has been appointed Assistant Superintendent of the Wyoming Division, with headquarters at Green River.

Wheeling Bridge & Terminal Co.—A meeting of the stockholders was held in Wheeling, W. Va., last week, at which these directors were elected: Hon. R. H. Cochran, George Baird, Frank J. Hearne, William F. Peterson, G. Brown and William A. Wilson, of Wheeling; W. A. Lynch, of Canton, and J. F. Freeman and R. B. Ferris, of New York.

Wichita & El Paso.—The following are the directors of this Kansas road, whose incorporation was referred to last week: W. A. Thomas, L. D. Skinner, George L. Rouse, W. A. Oliver and H. L. Pierce of Wichita, Kan., and A. J. S. Turley and Percy A. Wood, of Runnymede Kan.

Wiggins Ferry Co.—C. H. Sharman, Superintendent, has been appointed Assistant Manager of this company, which controls the East St. Louis Connecting Illinois & St. Louis and the Venice & Carondelet. The office of Superintendent has been abolished.

Williamsport Junction.—The first board of directors of this company are: George L. Sanderson, Williamsport, Pa., President; C. La Rue Munson, Addison Candor, E. P. Almy, Samuel Wilson and James S. Lawson, all of Williamsport, and Benjamin G. Welch, of Hughesvile, Pa.

OLD AND NEW ROADS.

Abbeville & Waycross.—Ground was broken on this line near Abbeville, Ga., March 12. The first 10 mile section has been cleared and the locating survey has been completed some distance beyond, and is now in progress to Waycross, a distance of 85 miles. The Abbeville Investment & Construction Co. has been organized to construct the road. S. T. Lasseter is President o

the construction company and J. D. Maynard is President of the railroad company.

Allentown Terminal.—This road was opened for regular traffic March 17. It is 3½ miles long, in the shape of a semicircle, and connects the Central of New Jersey and the Philadelphia & Reading, by whom it is jointly controlled. Those companies pay all taxes, five per cent dividends on the stock and four per cent. interest on the bonds. There are two bridges over the Lehigh River, one a mile below Allentown and the other the same distance above the town. The bridge crossing the eastern channel of the Lehigh at Allentown is 28 ft. high 336 ft. long and 30 ft wide. Crossing Kline's Island the bridge is 410 ft. long. 28 ft. high, 30 ft. wide. One span crosses the Lehigh Valley tracks at the East Pennsylvania Junction, near which the new road connects with the Reading. From this point the road takes a northerly turn and crosses the Lehigh Valley at grade, at two places. Near the East Pennsylvania Junction, over Jordan creek, there is a three-span, high truss bridge, 335 ft. long. The passenger and freight stations are at Hamilton and Race streets, in the centre of the city. The road is double-track, and passes through the city for over a mile. The bridge at the north end over the Lehigh river, near the Allentown Iron Works, to connect with the Central of New Jersey, is the longest on the line; it has four spans, each 150 ft. long and is 18 ft. wide. The cost of the bridges and stone viaducts was about $200,000.

Atchison, Topeka & Santa Fe.—The gross earnings, operating expenses (exclusive of taxes and rentals) and net earnings of the road and its auxiliary lines for the month of January were as follows:

	Gross earn.	Oper. exps.	Net earn.	Oper. Mileage.
Roads owned and controlled	$2,173,265	$1,499,852	$673,413	6,528
Roads jointly owned with other companies:				
Atch. Co.'s one-half	105,897	96,954	8,943	582
Totals	$2,279,162	$1,596,806	$682,356	7,110

The comparative statement, all lines, is as below:

	Gross earn.	Net earn.	Mileage.	Per mile. Gross earn.	Per mile. Net earn.
Jan., 1890	$2,279,162	$682,656	7,110.23	$320.55	$95.97
Jan., 1889	1,979,174	387,914	7,114.80	278.18	54.53
Inc. Jan. 1890	$299,988	$294,442	dec. 4.57	$42.37	$41.44

Atlantic & Danville.—The officials of Montgomery County, Va., have paid to the company $89,000 in county bonds, the county have voted $3,500 per mile for every mile of the road through the county.

Baltimore & Ohio.—A bill has been introduced in the Maryland Legislature authorizing the Board of Public Works to sell the shares owned by the State of Maryland in the stock of the Washington branch of the Baltimore & Ohio, and to provide for the application of the proceeds toward the payment of the public debt of the state.

The following statement shows the earnings of the system for the months of February, 1889 and 1890, the latter year being partly estimated. Gross earnings, 1889, $1,452,736; 1890, $1,709,310; increase, $256,574. Expenses, 1889, $1,155,536; 1890, $1,322,040; increase, $166,504. Net earnings, 1889, $297,200; 1890, $387,270; increase, $90,070. The earnings and expenses for the five months of the fiscal year, 1888-89, were: Earnings, 1889, $8,277,887; 1890, $9,948,097; increase, $1,670,210. Expenses, 1889, $6,078,978; 1890, $6,724,244; increase, $645,266. Net earnings, 1889, $2,198,909; 1890, $3,223,853; increase, $1,024,944.

Birmingham Mineral.—The branch from Helena to Gurnee, 10 miles, and to Blockton, Ala., 12 miles, is practically completed. The line will be placed in operation as soon as the surfacing is finished. It connects with the main lines of Louisville & Nashville and with the Briarfield, Blockton & Birmingham, the tracks of the latter being used between Gurnee and Blocton.

Birmingham, Sheffield & Tennessee River.—The extension from Jasper, Ala., south to a connection with the Georgia Pacific at Hewitt's Station, on the Georgia Pacific, was completed this week. The grading and tracklaying have been completed for some time, with the exception of a deep cut which has delayed the work. The extension gives the company connection with two lines into Birmingham, over the Kansas City, Memphis & Birmingham from Jasper, and over the Georgia Pacific from Hewitt's.

Boston & Maine.—The Railroad Committee of the Massachusetts Legislature has voted to report a new bill for the consolidation of the Boston & Maine and the Eastern roads, and to allow the Boston & Maine to issue $5,000,000 of new stock.

Bowling Green & Northern.—The contract for building this road between Bowling and Falls of Rough, Ky., 45 miles, has been agreed upon but no formal contract has been signed until some right of way matters have been settled. As soon as this is done it is expected that grading will begin.

Briarfield, Blockton & Birmingham.—The section between Gurnee and Blockton, Ala., 12 miles, was completed this week. The road is now completed to Montevallo, except about a mile between two creeks, east of the Cahaba River, over which the bridges have not yet been built. The Cahaba River bridge has not yet been completed.

Canadian Pacific.—Rails are now en route from England for the line from Sproal's Landing to the town of Nelson, Kootenay Lake, B. C., by which the ores of the Kootenay district may be transported to the smelting works at Revelstoke.

Central of Georgia.—The extension of the Savannah & Western from Eden west to Stirling, Ga., on the Savannah, Americus & Montgomery is now in operation to Conley, 38 miles. There still remain 27½ miles between Conley and Stirling to be completed. Trains will probably be run by May 10.

Chicago & Alton.—Concerning the recent statements regarding the double-tracking being done on this road, an officer states that it is the intention of the company to build this year a second track from Bloomington north to Lexington, Ill., a distance of 16 miles, and to complete the work between Lexington and Pontiac, 18 miles, during 1891. The road is at present double-tracked between Pontiac and Chicago, 92 miles.

Cincinnati, Jackson & Mackinaw.—The reorganization plan has been published and holders of securities have been invited to deposit them with the Central Trust Co., of New York. The reorganization committee proposes to buy in the road at foreclosure sale and issue new securities as follows: $3,266,000 first-mortgage 4 per cent. bonds at the rate of about $10,000 a mile, and $18,416,085 of common stock. The new bonds will be given in exchange for the present Cincinnati, Van Wert & Michigan first sixes, and for the Cincinnati, Jackson & Mackinaw first fives, dollar for dollar. This will dispose of all the new bonds. The new stock will be distributed in this way: $363,000 to holders of outstanding income bonds of the Cincinnati, Van Wert & Michigan at par, on payment of an assessment of $50 per bond; $5,504,000 to holders of the present preferred stock of the Cincinnati, Jackson & Mackinaw, share for share, on payment of an assessment of $5 per share; $10,413,835 to holders of the present common stock of the Cincinnati, Jackson & Mackinaw, share for share, on payment of $10 per share; $878,250 to holders of the Cincinnati, Van Wert & Michigan first mortgage six per cent. bonds, $750 in stock for each $1,000 bond; $1,257,000 to holders of Cincinnati, Jackson & Mackinaw five per cent. consolidated bonds, $600 in stock for each $1,000 old bond.

Cincinnati, Saginaw & Mackinaw.—The deed transferring the Toledo, Saginaw & Mackinac to this company has been formally filed in Michigan, the consideration being $3,000,000. A first mortgage for $2,000,000 issued by the company in favor of the Central Trust Co. has also been filed. Of this amount $500,000 is to be reserved for purchasing terminals in Saginaw, West Bay City and Bay City, Mich.

Columbus Southern.—It is expected to complete this road to Albany, Ga., 87 miles southwest of Columbus, this week. Trains are now running between Columbus and Dawson, 66 miles.

Cumberland & Washington.—The bill to lease the Chesapeake & Ohio Canal to this company has passed both branches of the Maryland Legislature. The company proposes to use the towpath of the canal to build a road between Cumberland, Md., and Washington. The bill met with some opposition, but was finally passed by a large majority. The company cannot yet take possession of the canal as Receivers have been appointed for it, pending the settlement of the various suits.

Danville, Mebane, Pittsboro & Southern.—Ground was broken this week on this road, at a point near Harrison Station, on the Atlantic & Danville.

Decatur, Chesapeake & New Orleans.—The proposition to vote this company $35,000 in bonds to secure the building of the road from the Lincoln County line to Shelbyville, Tenn., was carried in the municipal election in Shelbyville last week.

Denver & Rio Grande.—A circular has been issued to stockholders of the company by the directors, asking their consent to the issue of $4,500,000 of the five per cent. improvement mortgage bonds, the proceeds of which are to be expended upon the property. The circular says: The near completion of the standard-gauging of our connection on the West, from Grand Junction, has compelled the directors to order such work on the line as could be done during the winter months by the force in the company's employ, and for the past two or three months about 1,000 men have been engaged in preliminary work. The directors have concluded that to complete the work in hand—that is to say, make a standard gauge road from Denver to Pueblo and Trinidad, and from Pueblo to Leadville and Grand Junction (in connection with the Rio Grande Junction Railroad), thus completing a through standard gauge line to the Pacific Coast, and to provide new equipment therefor—it is necessary to issue $4,500,000 of the five per cent. improvement mortgage bonds. With the issue of that amount of the bonds the fixed charges will be in round figures $1,903,000 per annum, or at the rate of $1,270 per mile, while, by the statement of earnings for 1889, the net earnings for that period were $3,332,410, or at the rate of $2,232 per mile.

It is stated that a new survey for the Acequia cut-off, or Denver Short Line, which is projected to shorten the distance between Denver and Leadville, Col., will soon be made from Acequia to Florissant, passing up West Creek to a point near old Manitou Park, and then down the Houghton gulch to Florissant. By this route it is expected that some heavy grades will be avoided, and that a more direct line will be secured than by the route from Acequia to Buena Vista, 113 miles. One long tunnel in the South Platte tunnel may also be avoided.

Denver, Texas & Fort Worth.—The grading has been finished on the short extension from Hodge into the city of Fort Worth, Tex., and tracklaying will begin at once from Fort Worth north and from Hodge south. An iron bridge will be necessary to cross the Trinity River, and this will probably delay the opening of the line.

Drayton Harbor, Lynden & Spokane Falls.—This company has been chartered in Washington to build a road from a point on Drayton Harbor near Lynden, east through Whatcom County. The capital stock is $1,000,000. J. B. McMillan, D. H. Louderback and William Knight are incorporators.

Easton & Northern.—Tracklaying is in progress on this road between Easton on the Lehigh Valley and Ashland, Pa., 10 miles. The bridge at Stockertown, near Ashland, has been completed, and work is in progress on the two bridges at Walters' Mills, in the Bushkill Valley. Peter Brady, of Easton, is Chief Engineer.

East Tennessee, Virginia & Georgia.—A survey is being made for a branch from a point on the line near Bristol to Embreville, Tenn. Surveys will be made from Johnson City, Jonesboro and Limestone, and the branch will be from seven to 16 miles long.

Ellensburgh & Northeastern.—Mr. Herbert C. Ward, of Tacoma, Chief Engineer, gives the following as the route of this road in a letter to a Tacoma paper. From Ellensburgh, easterly through a valley between the Peshastin and Umptanum ranges to the Columbia River. The maximum elevation is 1,300 ft. lower than the summit of Stampede pass. A preliminary location has been made to the Columbia River; the ground is for the most part favorable with a maximum grade of 116 ft. per mile, the same grade as the one on the Pacific division of the Northern Pacific into Tacoma, with 12 degree curves. On this work the engineers have been employed since last July, making surveys, maps and estimates. An examination has been made of Crab Creek Valley, and the general route to Lind and also from a point called Eastern Bend to the proposed junction with the Central Washington near Grand Coulee. The distance from Ellensburgh to Lind would be about 80 miles shorter than by the present line of the Northern Pacific.

Florida Southern.—A bill was filed in the United States Circuit Court for the Northern District of Florida, at Jacksonville, March 18, by the trustees of the first mortgage bonds, praying for a foreclosure of the mortgage and the appointment of a receiver. The court appointed J. R. Parrott, Counsel for the Jacksonville, Tampa & Key West, Receiver. The latter system operates the Florida Southern, and owns a majority of the stock. The bonded indebtedness is $3,000,000, and interest has been defaulted since July, 1888. The bonds are in two classes, one issued on the main line and the other on the Charlotte Harbor Division. The American Loan and Trust Co., of Boston, is trustee for the former, and the New England Trust Co. is trustee for the latter. The St. Johns & Lake Eustis Division is a distinct company, and is not affected by these proceedings.

Fort Madison & Northwestern.—The sale of the road, made Feb. 25, has been confirmed by the United States Court at Keokuk, and the purchase money has been ordered to be paid by April 1. The purchase was made by Willard Block, of Des Moines, representing the Iowa & Nebraska road, the price being $53,700.

Fort Worth & Rio Grande.—Contracts for grading the section from Dublin southwest to Comanche, Tex., a distance of 25 miles, have been let to a Mr. Fouts, and grading has been commenced.

French Broad Valley.—The survey for the road is still in progress between Hendersonville, N. C., and Reedy Patch Gap, in the Blue Ridge.

Georgia, Carolina & Northern.—Grading is in progress in Elbert County, Ga., south of the Savannah River, and is making rapid progress. All the line in Elbert County to the Broad River is under contract. Wright Bros., of Birmingham, Ala., and John Kelly, of Lynchburg, Va., have each 10 miles.

Georgia Southern & Florida.—The last rail was laid near Palatka, Fla., March 11, and the first regular through train from Macon was run through March 15. The distance is 283 miles.

Grand Trunk.—Work will begin soon on the second track between Toronto and Hamilton, Ont., and tenders for grading and widening the cuts on the 40 miles have been asked. The work on the double track between Toronto and Montreal, for which McArthur Bros. have the contract, will probably be resumed very soon.

It is stated that a compromise is being arranged between the city of Hamilton, Ont., and the company in regard to the proposed branch at Hamilton, but the nature of the agreement is not published. The company wishes to build a cut off from Stoney Creek to Burlington Beach, near Hamilton, about six miles. The city claims that the construction of this line would be a violation of the agreement under which it voted bonds some years ago to the Hamilton & Northwestern, which is now controlled by the Grand Trunk. In the agreement was a condition that the Hamilton & Northwestern should not connect with a road built east from the city. It is claimed that as the branch is built to relieve the freight yards in Hamilton by carrying freight between Toronto and Canada around, without passing through, the city, its construction would be a violation of the agreement.

The company has given notice of its intention to apply to Parliament for an act to aid the St. Clair Tunnel Co.; to raise additional funds for double tracking its lines; to enable the company to advance funds to the Midland, of Canada, for rebuilding bridges and other works; to aid the Detroit, Grand Haven & Milwaukee for the purpose of acquiring rolling stock, and also for power to lease or make other arrangements for operating roads which have been authorized to make such arrangements and to acquire the shares and securities of those companies.

Hartford & Connecticut Western.—A special meeting of stockolders was held in Hartford, Conn., last week to vote on the proposition to lease the road to the Central New England & Western for 50 years. The proposition was ratified by a vote of 15,503 shares in favor against 3,906 against it. Most of the stock voted in favor of the lease is owned by stockholders of the Central New England & Western. The minority stockholders opposed the lease strenuously.

Houston & Texas Central.—The grading on the short extension from Hutchins to Lancaster, Tex., a distance of five miles, will probably be completed by April 1.

Interoceanic.—Tracklaying on the division between Pueblo and Vera Cruz has been completed from Perote through Jalapa, and for a distance of about 10 miles beyond the latter point towards the Atlantic terminus at Vera Cruz, about 130 miles from Perote. The section from the City of Mexico, through Pueblo to Perote, a distance of 200 miles, has been in operation some time. On the Pacific division from the City of Mexico to Anacusac, 143 miles, trains are running to Tlaltizapam, 114 miles from the City of Mexico. The construction work is now completed for some distance beyond this point.

Iowa Central.—A trackage agreement has been made by this company with the Atchison, Topeka & Sante Fe by which it secures the right to run its trains into Chicago over the tracks of the latter road. The connection was made at Monmouth, Ill., and necessitated the construction of two miles of road.

Kansas & Arkansas Valley.—This branch of the Missouri Pacific has filed an amendment to its charter in Arkansas providing for new extensions. The road at present extends from Van Buren, Ind. Ter., to Coffeyville, Kan., at the state line. One branch will be from near Fort Smith northerly, crossing the Arkansas River to the boundary line between Arkansas and the Indian Territory. It will be six miles long, and will cost, with a bridge, $530,000. Another extension will begin near Wagoner, Ind. Ter., thence westerly and northwesterly to Guthrie, Oklahoma, and to the western boundary of Indian Territory; a branch from a point on the last-named line southwesterly through Oklahoma City and Fort Reno Reservation to a connection with the Fort Smith, McAllister & Western, near the northern boundary of the Wichita country. The length of the extensions will be 440 miles.

Kentucky Midland.—A regular train service will be put on between Georgetown and Paris, Ky., 17 miles, this week.

An extension will probably be built from Paris, south to North Middleton, 8 or 10 miles.

Kentucky Roads.—Bills have been introduced in the Kentucky Legislature to incorporate the following companies: Cincinnati, Covington & Rosedale, to build from South Covington to Covington and Cincinnati; the capital stock is $100,000, and F. J. Meyer, G. W. Howell and

G. Mason are incorporators; Paducah, Nashville & Charleston; Waco & Richmond; Big Hill & Manchester; Three Forks Belt Line, and West Point & Louisville. Bills have been passed incorporating the Somerset & Eastern Kentucky, Bowling Green & Southern and Cumberland.

Knox & Lincoln.—It is stated that Levi C. Wade, of Boston, has made an offer on behalf of an Eastern syndicate to purchase this road for $1,300,000. It extends from Bath to Rockland, Me., a distance of 45 miles.

Lancaster, McKee & Middlesborough.—A bill has recently been introduced in the Kentucky Legislature to incorporate a company of this name to build a road from Burgin, the present terminus of the Louisville Southern, to Lancaster, Boone's Gap, McKee, Manchester, and thence to Middlesborough, in Bell County.

Lincoln, Sioux City & Yankton.—Articles of incorporation have been filed in Nebraska by this company, with a capital stock placed at $2,500,000, to build a road from Lincoln northerly to Covington, Neb., opposite Sioux City, and to a point in Cedar County opposite Yankton, S. D. The route is through the counties of Lancaster, Saunders, Dodge, Colfax, Cuming, Stanton, Wayne, Dakota, and Cedar. This road and the Lincoln & Western are projected by the Board of Trade of Lincoln, and the incorporators are members of that body. T. P. Kennard, of Lincoln, is interested in the projects, and one of the incorporators.

Lincoln & Western.—This company has been chartered in Nebraska to build a road from Lincoln westward to Beaver Crossing on the Fremont, Elkhorn & Missouri Valley and to McCool Junction on the St. Joseph & Grand Island, and thence through the counties of Lancaster, Seward, Saline, Fillmore, York, Clay, Nuckolls, Adams, Kearney, Phelps, Gosper, Frontier, Hayes and Chase. The capital is $4,000,000. The principal office will be at Lincoln.

Los Angeles, Pasedena & Glendale.—The road was formally opened between Los Angeles and South Pasedena, Cal., seven miles, last week, as anticipated in our issue of March 7.

Louisville, Evansville & St. Louis.—Residents of Perry, Crawford and Harrison counties, Ind., are renewing the agitation for a branch of this road to extend through Perry county via White Sulphur wells, Leavenworth and the Wyandotte cave, to Corydon station.

Louisville, Hardinsburg & Western.—There is now 36 miles of tracklaying completed between Irvington, on the Louisville, St. Louis & Texas, and Fordsville, Ohio County, Ky., a total distance of 40 miles. Thirteen miles were laid since Jan. 1. Tansy & Corrigan, of Fordsville, have the contract and have about 200 men engaged on the work. All the grading has been completed on the main line and about half on the branch to Falls of Rough, 4½ miles. C. W. McCracken, of Hardinsburg, Ky., is Chief Engineer.

Mississippi River & Bonne Terre.—The road was, on March 10, opened for traffic between Bonne Terre, on the St. Joe road, and Crystal City, Mo., on the St. Louis, Iron Mountain & Southern, near the Mississippi River, a distance of 30 miles. The road has been built as an outlet for large lead mines at Bonne Terre, in St. Francois County.

Missouri Pacific.—It is stated that Moran Bros. have the contract for building the first ten miles from Boonville, of the extension to Jefferson City, 46 miles, and it is reported that the contracts for the remaining 36 miles will also soon be let.

Missouri River, North Platte & Denver.—The various towns and counties through which this road is projected have voted about $250,000 in bonds to the company. The route is from a point on the Missouri River at or near Decatur in Burt County, west via Albion, Broken Bow, and North Platte to Denver. The survey from Albion to Wallace in Lincoln County, a distance of 24 miles, has been completed. The grades will be light and on the section so far surveyed there will be 5,758,496 cubic yards of earthwork and 25,518 lineal feet of bridging. The prospects for the early completion of this portion of the road are claimed to be good. The line is through a good agricultural country and a large portion of it is as yet unoccupied by railroads. Loran Clarke of Albion, Neb., is President, and J. W. Andrews of Fremont, Neb., is Chief Engineer.

Mobile & Girard.—In the suit of the United States against this company, a leased line of the Central of Georgia, the Federal District Court at New Orleans has appointed B. W. Walker receiver in charge of the unearned land grant, which the United States is seeking to recover. The company has been enjoined from selling any portion of the land in dispute, from cutting timber on it, and from removing the timber which has been already cut. The land is mostly in South Alabama.

Mobile, Jackson & Mississippi.—The Anglo-Southern Construction Co., which has the contract for building the line between Mobile, Ala., and Jackson, Miss., has asked the citizens of Jackson to subscribe $70,000 to the preferred stock of the road. The company agrees to begin construction work at Mobile and Jackson at the same time, and to complete the line in 18 months.

Mobile & Western Shore.—A company of this name has been incorporated in Alabama to build a short road at Mobile, Ala.

Mount Penn Gravity.—This road up Penn mountain from Reading, Pa., is now completed and ready for operation. It is 7½ miles long, and follows a picturesque route over the hills and mountains east of Reading. Trains will begin running about April 1.

Nashville, Chattanooga & St. Louis.—The company has agreed to build an extension of its Jasper branch from Dunlap to Pikeville, Bledsoe County, Tenn., if the right of way is granted and the branch is exempted from taxation for 20 years.

New Roads.—A road is proposed from Cisco, Tex., on the Houston & Texas Central, and the Texas & Pacific north through Eastland, Stephens and Young counties, to a connection with a branch being built by the Fort Worth & Denver City, from Wichita Falls. The distance is about 40 miles.

At a mass meeting at Pierre, S. D., a committee was appointed to secure the right of way for a road from Pierre east to Aberdeen, a distance of about 120 miles. A company has been organized with a capital stock of $500,000 to grade the road. It has already been surveyed. Another line is projected from Pierre west across the Sioux Indian Reservation to Rapid City.

The Union Cotton Compress Co., of Charleston, S. C., has received a franchise and right of way from the city for a belt line around the east shore water front, connecting with all the wharves.

A survey from Franklin to Tallulah, Ga., has just been made, and is now in progress between Franklin and Maryville, Tenn.

The organization of a company to build a dummy line between Opelika and Auburn, Ala., is being perfected.

The preliminary survey has been made for a proposed road along the shore of Lake Erie on the Canadian side, near Buffalo, from Fort Erie to Point Albino, a distance of 10 miles.

New York Central & Hudson River.—The earnings of the road and its leased lines for the three months and the half year to March 31 were as follows, the earnings for 1890 being estimated:

Quarter to March 31.	1890.	1889.	Inc.
Gross earnings	$8,527,258	$8,033,478	$493,780
Operating expenses	5,653,221	5,501,108	152,113
Net earnings	2,874,037	2,532,370	341,667
Fixed charges	1,965,420	1,963,260	22,160
Profit	908,617	569,110	339,507
Dividends	894,283	894,283	.....
Surplus	14 334	Def. 315,173	339,507
Six months to March 31.			
Gross earnings	$18,058,510	$17,204,367	$854,143
Operating expenses	11,872,569	11,472,748	399,821
Net earnings	6,185,941	5,731,619	451,322
Fixed charges	3,930,840	3,926,520	4,320
Profit	2,255,101	1,805,099	450,002
Dividends	1,788,566	1,788,566	.....
Surplus	466,535	16,533	450,002

New York & New England.—It is reported that this company intends to complete a line of its own between Boston and Providence. It now runs trains between the two cities, using the leased Rhode Island & Massachusetts from Franklin, Mass., to Valley Falls, R. I., and the New York, Providence & Boston thence to Providence. But the latter road will not participate in reduced passenger rates, which are necessary in order to get business away from the older lines, and a petition has been presented in the Massachusetts Legislature asking authority for the Rhode Island & Massachusetts to issue bonds, which it is understood are for the purpose of building the proposed extension. The country between Valley Falls and Providence is thickly settled, but the New York & New England controls an entrance to the city from the west.

New York, Ottawa & Northwestern.—The Canton & St. Lawrence Railroad & Bridge Co., and the New York, Ottawa & Northwestern, which have charters for a road from Jersey City, N. J., to Ottawa, have been consolidated under this name.

Ohio & Northwestern.—This road extending from Idlewild, near Cincinnati, to Portsmouth, O., was sold by order of the United States Court, at Cincinnati, March 13, to William Brockie, President of the Philadelphia Investment Co., for $900,000. The purchaser represents the owners of the greater portion of the bonds.

Pacific Short Line.—A dispatch from Sioux City, Ia., says that tracklaying on this line has been stopped by an attachment sued out by the Union Loan & Trust Co., of Sioux City, as agent for the Manhattan Trust Co., of New York, which holds a mortgage on the 5,000 tons of steel rails delivered at Sioux City. About 500 tons had been released and laid, but a new complication arose and the attachment was put on the track thus completed.

Pecos River.—This is the name of the Texas division of the Pecos Valley road of New Mexico. The charter filed at Austin provides for a road from a point on the Texas Pacific in Ward County, through Loving and Reaves County to the New Mexico boundary line, at or near where the Pecos River enters Texas. The distance is about 50 miles. The capital stock is $400,000. J. J. Hagerman, of Colorado Springs, Colo. is President.

Pennsylvania.—The survey for the proposed line from Reading to Lebanon, Pa., parallel to the Lebanon Valley branch of the Philadelphia & Reading, has been completed for about half the distance to Wommelsdorf, and is now in progress west of that point to Lebanon.

Peoria & Eastern.—The deed of sale of the Ohio, Indiana & Western to this company was filed in Illinois last week; the consideration being $4,000,000 income bonds, $7,930,000 first consolidated mortgage bonds and $9,999,500 capital stock. Two mortgages given by the company were filed at the same time. They are to the Central Trust Co. of New York, and C. W. Fairbanks, Trustee, one being for $4,000,000 income bonds, the other for $10,000,000 first mortgage bonds, $7,930,000 to be used in part payment for the Ohio, Indiana & Western, $1,500,000 to be reserved for the purpose of exchange for the same amount of prior bonds now a lien on the road, and which it is understood the owners refuse to surrender, and $570,000 to be used for reorganization purposes. Under the agreement made with the Cleveland, Cincinnati, Chicago & St. Louis, that road will begin to operate the line on April 1, in accordance with its terms. It guarantees the interest on the bonds.

Pittsburgh & Virginia.—It is expected that a new survey will begin in about a month. A reconnoisance has already been made of a large portion of the route.

The line will probably follow North River from Lexington, Va., to the Chesapeake & Ohio at Goshen, then northerly to the Bull Possum River, where it will follow to its head and over the divide between the James and the Potomac Rivers, to the North Fork of the Potomac, piercing Alleghany Mountains at the head of Big Run, a branch of the North Fork of the Potomac; then down the Gandy and Dry Forks to the Cheat River, then down the valley of that river toward Pittsburgh. Gen. Fitzhugh Lee, of Lexington, Va., is President, and F. E. Montague, of Clifton Forge, Va., is Chief Engineer.

Richmond, Fredericksburg & Potomac.—Mason, Hoge & Co., of Frankfort, Ky., have the contract for finishing the work on the line being built at Richmond, Va., to connect the tracks of the Richmond, Fredericksburg & Potomac and the Richmond & Petersburg. The line is eight miles long. The bridge over the James River is nearly completed. It is 2,300 ft. long and is being built by the Edge Moor Bridge Works.

Richmond & West Point Terminal.—The company has decided to erect a new union station in Atlanta, Ga., to be located between Alabama and Mitchell streets, and to build a belt line around the city, from a point on the Georgia Pacific to a point on the Central of Georgia. The cost of the improvement is placed at $500,000, the estimated cost of the station and belt line being placed at $250,000 each.

Rio Grande Southern.—The contract for grading between Dallas and Telluride, Col., 45 miles, has been awarded to Carlisle & Westbree, of Pueblo. Ten miles have been cross sectioned, and the contractors will begin work on this section in about ten days. The grade is about three per cent.

Roanoke & Southern.—The Virginia and North Carolina Construction Co. has accepted its option to build the division between Martinsville and Roanoke, Va., 55 miles, and has ordered work to commence at once. The line is now in operation from Winston, N. C., north for a distance of 26 miles, and the grading and tracklaying has been completed to near Martinsville, Va., 60 miles.

Rockaway Valley.—The company proposes to issue $300,000 of new five per cent. bonds and to use the proceeds to build the extension from Peapack, northeast 10 miles to Morristown, N. J., on the Delaware, Lackawanna & Western.

St. Joseph & Excelsior Springs.—The charter of this company has been filed in Missouri. The capital stock is placed at $1,000,000. The road is to extend from St. Joseph through Buchanan, Platte, Clinton, Clay and Ray counties to Excelsior Springs, a distance of 60miles.

St. Louis, Chester & Grand Tower.—This company filed its articles of incorporation at Springfield, Ill., March 17. It is proposed to construct the road from East St. Louis through the counties of St. Clair, Monroe, Randolph and Jackson to Grand Tower. The principal office of the company will be at East St. Louis. The capital stock is $1,500,000.

Scioto Valley & New England.—At a special meeting of stockholders in Columbus, O., March 12, the sale of the Scioto Valley to the company was ratified and the directors were authorized to issue $15,000,000 of first mortgage bonds and to increase the capital stock to a like amount.

Sea Side & Brooklyn Bridge Elevated.—The company has been organized in Brooklyn, N. Y., to build an elevated road from the present terminus of the Union Elevated at Greenwood to Fort Hamilton. The capital stock of $1,000,000 was subscribed for by parties who control the present Union system, so that the new road will merely be an extension. The franchise has not yet been secured from the city. S. Uhlmann is President.

Seattle, Lake Shore & Eastern.—Between 600 and 700 men are reported working on the northern branch of this road between Snohomish, Wash, and the International boundary. J. W. McLeod has nearly 300 men engaged in grading and tracklaying on the 27 miles north of Snohomish toward the Stillaguamish River. The bridge over the river is being erected by the San Francisco Bridge Co. and will be completed before the tracklaying reaches that point. Contractor McLeod has a large force clearing and grading between the Stillaguamish River and Murray Lake, a distance of 10 miles. Contractor Murphy has another force clearing along Big Lake north to the Skagit River. P. H. Smith & Bro. have 5 miles cleared on their contract of 15 miles north of the Skagit River. Clement, Bradford & Co. have about 5 miles cleared and graded on a 10-mile section in the Nooksack Valley. N. J. Henry has cleared and is now grading on the 5 miles adjoining, north of the fork of the Nooksack. The 5 miles adjoining is not under contract, but is all cleared and the grading is light. The next 5 miles, which extend to the boundary, are graded, bridged and ready for tracklaying. Tracklaying will be carried on from three different points on the branch from the present terminus of the Skagit River, and as soon as the Canadian Pacific completes its branch from Mission south to the boundary line, tracklaying will commence from that point. Rails have already been laid to a point about 15 miles north of Snohomish. No work is at present being done on the eastern extension of the road. It is probable that some change will be made in the line of the Eastern extension, as the present surveyed line is considered impracticable.

Seattle & Montana.—The articles of incorporation of this company have been filed in Washington. The abstract of the route which is given is quite general, from Seattle to Spokane Falls and the eastern boundary line of the State. Press dispatches state that it is an extension of the Great Northern Line from Helena, Mont., but it is probable that that company has no connection with the scheme. The city of Seattle has granted the company a valuable franchise through that city, and right of way from the north end of the city, crossing Salmon Bay, and along the water front, on Railroad avenue, to West Seattle.

South Bound.—The City Council of Savannah, Ga., has granted this company right of way through the city on Bay street and a tract of 27 acres of land near the Central of Georgia shops. The grant is estimated to be worth $250,000. It is claimed that the construction company will complete its organization this month, and that grading will commence early in April between Savannah and Barnwell, and Columbia, S. C.

Spokane Falls & Northern.—The section between Colville and Marcus, Wash., on the Columbia River, a distance of 16 miles, will be completed and probably opened for traffic this week. The road is now in operation between Spokane Falls and Colville, 88 miles. The company proposes to extend the line north from Marcus to the international boundary, 16 miles. One line will branch to Nelson, on Kootenay Lake, B. C., and the other will extend west to Osogoos Lake and the mouth of the Fraser River. The legislature of British Columbia passed bills giving the company charters to build the lines; it was also necessary to secure a charter from the Dominion parliament, but the bills failed of passage through the railroad committee of the House.

Tacoma Belt.—This company was incorporated in Washington last week to build a belt road at Tacoma for freight and passenger traffic. Electricity or steam is allowed as the motive power. The capital stock is $30,000.

Toledo, Ann Arbor & North Michigan.—A consolidated mortgage on the road will be filed for record shortly. It provides for the issue of $10,000,000 five per cent. bonds to take up $5,040,000 outstanding divisional bonds as follows: Toledo, Ann Arbor & Grand Trunk, $1,200,000; Toledo, Ann Arbor & North Michigan, $2,120,000; Toledo, Ann Arbor & Mt. Pleasant, $400,000, and Toledo, Ann Arbor & Cadillac, $1,200,000; total, $5,040,000; also to purchase the Toledo, Ann Arbor & Lake Michigan road, 44 miles of which have been constructed and 250 miles projected. The Executive Committee of the company is authorized to issue and sell $200,000 of the bonds to pay for terminal properties to be acquired, and to establish a line of steamers across Lake Michigan, to operate in connection with the company's railroad. About $800,000 of the bonds are to be issued for

new mileage as needed. The existing bonds are to be exchanged dollar for dollar, for the new five per cents., and the Toledo, Ann Arbor & Lake Michigan bonds exchanged on the same basis.

Toledo, St. Louis & Kansas City.—On the western division of the road, the work of cutting down the grade at Donnellson has been accomplished, reducing the greatest grade on that division to 40 ft. per mile. The grades on the eastern division, between Frankfort and Toledo, do not now exceed 20 ft. to the mile.

The company has agreed to build a branch from Evansville to Glover Hill, Paulding County, O., a distance of eight miles, if that town will raise $3,000.

Union Pacific.—The following statement shows the earnings and expenses for the month of January:

	1890.	1889.	Inc. or de.
Entire System:			
Gross earnings	$2,289,762	$2,423,313	$133,550
Operating expenses	1,933,234	1,840,330	152,904
Net earnings	$296,528	$582,983	$286,474
Oregon Railway and Navigation:			
Gross earnings	$126,249	$264,995	$138,746
Operating expenses	226,906	234,404	7,498
Net deficit	$100,657	$30,591	$131,248
Oregon Short Line:			
Gross earnings	$333,043	$460,854	$127,811
Operating expenses	332,145	299,081	33,064
Net earnings	$898	$161,773	$160,874

Utah Central.—The articles of incorporation of this company were filed in Salt Lake City last week. It is a consolidation of the Salt Lake & Eastern, Salt Lake & Ft. Douglas and Utah Western, which comprise about 250 miles of projected road, of which 67 miles are in operation. The Salt Lake & Eastern extends from Salt Lake City to Park City, Utah, 35 miles, with a branch from Sugar House to Cottonwood, 19 miles, and the Salt Lake & Fort Douglas extends from Salt Lake to Wagner's, nine miles, with a branch from Fort Douglas to Red Butte, seven miles. The Utah Western is partly completed between Salt Lake City and Monahansett Beach, and Grantsville, 40 miles. The extensions projected are: On the Salt Lake & Eastern, in three directions from a point near Park City, first, 25 miles to the head of the Provo River to a large timber tract; second, eight miles to Heber City, reaching deposits of flagging stone; third, 20 miles up the Weber Canyon to coal fields; fourth, from Sugar House Junction to Granite, 15 miles. The Utah Western is graded between the Jordan River, near Ninth North street, Salt Lake, to Monahansett Beach, 10 miles, and it will probably be opened between these points by May 20. A belt line will be built at Salt Lake to connect these three lines in the city.

Western Maryland.—Both branches of the Maryland Legislature have passed the bill authorizing the company to build its proposed tide-water terminal extension in Baltimore. The City Council of Baltimore has already passed an ordinance giving the company the right to lay tracks on certain streets in the city. The tracks and harbor terminals of the Northern Central are at present used. Hearings have been held by the Senate on bills providing for an extension along Jones Falls to tide-water in Baltimore, crossing the Northern Central tracks below grade; empowering the company to lease other lines and chartering the Potomac Valley road to build an extension from Williamsport to Cherry River, Pa., and favorable reports have been made on the three bills.

West Point & Louisville.—This company has introduced a bill in the Kentucky Legislature to incorporate it to build a road from a point in Bullitt county, near West Point, to a point in Jefferson county, near the headwaters of Harod's Creek. The capital stock is placed at $3,000,000. The incorporators are H. C. Chessman, F. De Funiak, Turner Wilson, John L. Snead, T. J. Pottinger, J. W. Croan and others.

West Virginia Central & Pittsburgh.—A special meeting of stockholders was convened in Baltimore, March 15, to take action on a proposed lease of the Piedmont & Cumberland, which is now being operated for 60 per cent. of its gross earnings. The committee having the matter in charge reported in favor of the lease, the terms being practically the same as those by the present arrangement, but one of the stockholders secured an injunction restraining any action being taken in the matter.

Williamsport Junction.—This company has been incorporated in Pennsylvania to construct a line from a point on the Williamsport & North Branch road in Loyalsock, Pa., to a point on the Pine Creek road in Woodward, in Lycoming county, a distance of about seven miles. The capital stock is $175,000. The principal office is at Williamsport, Pa. George L. Sanderson, Williamsport, is President.

Winnipeg & Hudson Bay.—A petition signed by a majority of members of the Dominion Parliament has been presented to the Government asking it to grant additional aid to the road. It has already received from Parliament the following land grants made to it in 1884. From Winnipeg to the northern boundary of Manitoba 1,440,000 acres; from the Manitoba boundary to Nelson River, Hudson Bay, 5,440,000 acres; a branch from northern extremity of Lake Winnipeg to intersection with Manitoba & Northwestern, 1,660,000 acres, a total of 8,540,000 acres. An arrangement was made with the Manitoba Government by which bonds of the Province were to be issued for the land, as the road was completed. Owing to ministerial complications this agreement has not been carried out, and the company has asked the Dominion Parliament to guarantee interest on bonds issued on 50 miles of completed road, which are secured by a mortgage on the land.

Yemassee & Walterboro.—The Walterboro Construction Co. has been organized at Walterboro, S. C., to construct this road. W. Stewart and W. Gregg, of Charleston; J. J. Cummings, D. C. Wilson and George Waterhouse, of Beaufort; J. R. Stokes, W. I. Stokes and A. Wichman, of Walterboro, and Alfred Aldrich, of Barnwell, are the incorporators.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, March 19.

There has been no material change in the traffic situation the past week. The various associations met and transacted only such business as was pressing. Many subjects were either suspended or postponed. No road seemed willing to "start the ball rolling" by making any charges, and there was an evident disinclination to mention the rate disturbances.

Representatives of the coal carrying lines in Pennsylvania and Ohio met March 13 to fix rates from the mines to lake ports for lake shipments, but could not agree, and adjourned to meet at Cleveland, March 17.

The Presidents of the Interstate Commerce Railway Association held a meeting yesterday, and formally took action in regard to the withdrawal of the Wisconsin Central. Only five representatives were present and no other business was transacted.

Chairman Walker attended the hearing before the Interstate Commision at Sioux City last week, and is also in attendance at Lincoln to-day.

Governor Thayer, of Nebraska, has again addressed one of his characteristic letters to the roads, charging that the failure of the recent reduction in corn rates to benefit the farmers was because they were not reduced so much but that the "speculators, gamblers, dealers in futures and boards of trade in Chicago" dared to break the market. He again demands a reduction of 10 cents per 100 lbs., and warns the roads of the disastrous consequences to them which will follow if they do not heed his "friendly warning."

At the hearing before the Interstate Commerce Commission in the investigation in regard to transportation charges on food products, Chairman Walker testified, reviewing the recent reductions in the rates on corn from Kansas and Nebraska. He said: "The only benefit to the producer has been in a limited territory, where by reason of the 25-cent maximum rate the reduction in the price has not equalled the reduction in the rate, and this is the only useful result which has been reached from the large loss assumed by the carriers. It was, and is the opinion of experts that a larger reduction would be followed by a like result. Under present conditions, the question of price obtainable for the food products of Kansas and Nebraska has no relation whatever to the rates of transportation charges thereon. So long as the supply largely exceeds the demand and the effort to sell is persistent, the price will remain in the hands of buyers, and the consumers only will be benefitted by reductions in tariff rates. So long as pressure to sell continues and the market is weak, any attempt to regulate tariffs for the advantage of the producer will necessarily result in failure."

Proposed Amendments to the Inter-state Commerce Law.

Mr. Baker, of New York, chairman of the House Committee on Commerce, has introduced a bill amending the Inter-state Commerce law. The bill is understood to have the approval of the Inter-state Commerce Commission, its features being similar to those recommended by the Commission in its last annual report. The bill permits the free carriage of persons injured in railroad accidents, as well as of physicians and nurses for attendance upon persons so injured; allows free transportation or reduced rates to resident families of employés of railroads; prohibits the payment, directly or indirectly, of any compensation whatever by one railroad to another for the sale of tickets, or for influencing business in its favor; declares that, whenever any common carrier subject to the Inter-state Commerce law shall pay any salary or make any allowance in the nature of compensation for services in connection with the sale of passenger tickets, the person to whom such compensation is allowed shall be held to be the agent of such common carrier in connection with the sale of such tickets and the common carrier is held to be liable for any such violations of the act on the part of the agent.

It is also provided that all regularly appointed ticket agents shall be supplied with certificates of appointment as such, and shall keep the same exposed to public view in their offices. It is declared to be unlawful for any person not holding the certificate above referred to to sell, barter or transfer for any consideration any ticket of any common carrier. A fine of $5,000 is imposed for violating this provision. It is also provided that common carriers shall at the request of a purchaser, redeem an unused ticket at its cost price; and if the ticket has been used only in part, the unused portion shall be redeemed at the price paid, less the regular schedule price for the distance used, if presented within 90 days after purchase. The sale by any persons of any partly used ticket, except as above, is made a violation of this act. It is also declared to be unlawful for any common carrier to pay any sum whatever, or valuable consideration, to secure the forwarding of immigrants by any particular route. Carriers are, however, permitted to make such arrangements among themselves for the routing of immigrants who do not choose their own route as may be approved by the Commission.

The Commission is authorized and required to determine what rate of compensation may be allowed or paid by any common carrier for the use of any car belonging to any other corporation or person, and shall have power to change such rates by giving reasonable notice thereof.

Other amendments extend the act to roads running partly in this country and partly in Canada.

Senator Cullom on Tuesday introduced a bill to amend section 12 of the Interstate Commerce Act so as to provide that the Commission shall have authority to inquire into the management of the business of all common carriers and shall keep itself informed as to the method in which the same is conducted; upon the request of the commission the District Attorney to whom it may apply may prosecute, under the direction of the Attorney General, all necessary proceedings for the enforcement of the provisions of the law and for the punishment of its violators.

Decision on the Car-Load Lot Cases.

The Interstate Commerce Commission, on March 15, in an opinion by Commissioner Schoonmaker, decided the cases known as the "car-load lot cases," brought against the trunk lines by F. B. Thurber and others, Thomas L. Greene, manager Merchants' Freight Bureau, and Francis H. Leggett & Co., of New York City. Complaint was made of too great differences in rates charged on carloads and less than carload quantities. The cases were filed over two years ago, and the testimony was taken in January, 1888. The points decided are briefly as follows:

A classification of freight designating different classes for carload quantities and for less than carload quantities for transportation at a lower rate in carloads than in less than carloads, is not in contravention of the Act to Regulate Commerce. The conditions of the transportation in respect to the work done by the carrier and the revenue earned are dissimilar, and may justify a reasonable difference in rate. The public interests are subserved by carload classifications of property. Carriers are not at liberty to classify property as a basis of transportation rates and impose charges for its carriage with exclusive regard to their own interests, but they must respect the interests of those who may have occasion to employ their services, and conform their charges to the rules of relative equality and justice which the act prescribes. Cost of service is an important element in fixing transportation charges, but the value of the service to the property carried is an essential factor. The public interests are not to be subordinated to those of carriers, and require proper regard for the value of the service in the apportionment of all charges upon traffic.

A difference in rates upon carloads, and less than carloads of the same merchandise between the same points of carriage so wide as to be destructive to competition between large and small dealers, especially upon articles of general and necessary use, and which, under existing conditions of trade, furnish a large volume of business to carriers, is unjust and violates the provisions and principles of the act. A difference in rate for a solid carload of one kind of freight from one consignor to one consignee and a carload quantity from the same point of shipment to the same destination, consisting of light freight from more than one consignor to more than one consignee, is not justified by the difference in cost of handling. Under the "Official Classification," the articles known in trade as grocery articles, are so classified as to discriminate unjustly in rates between carloads and less than carloads upon many articles, and a revision of the classification and rates to correct unjust differences and give these respective modes of shipment more relatively reasonable rates is necessary, and is so ordered.

Uniform Bills of Lading.

A Cleveland paper states that the uniform bill of lading which has been under discussion by the Central Traffic and Trunk lines for some time, and has been finally perfected to the satisfaction of a committe, is meeting with many objections from the individual lines to which it has been sent for approval. The chief objection to the bill has been the elision of the subrogation clause. This clause now appears on most bills of lading in use. It transfers to the carrier all claims which the shipper may have by way of insurance policy. But in the South the clause has been for some time a dead letter. By common practice it has been stricken out in all cotton traffic. Then it was cut out in grain shipments from St. Louis, and lately the flour shippers of the Northwest have demanded and received the same erasure in their bills of lading.

A Big Shipment.

The immense armor-plate bending machine made for the Navy Yard at Mare Island, Cal., was shipped March 15 from the Niles Tool Works, Hamilton, O., over the Cincinnati, Hamilton & Dayton. The machine was loaded upon 11 specially strong flat cars. The two largest castings weigh respectively 66,400 and 66,200 lbs., and the gross weight of the train was 675,350 lbs. The freight, which was prepaid, amounted to a little more than $10,000. This is believed to be the largest shipment of one single machine ever made in the United States.

Weighing and Inspection Bureaus.

The following is the statement of the Western Railway Weighing Association and Inspection Bureau for January:

	Corrections.	Increase in revenue.
Chicago and vicinity	2,511	$5,522
Milwaukee	657	622
St. Paul and Minneapolis	1,090	3,966
St. Louis and East St. Louis	1,541	2,902
Des Moines	591	875
Sioux City	119	1,034
Missouri Valley	38	125
Omaha, Council Bluffs and Union Pacific transfer	847	3,780
Kansas City, Leavenworth and Atchison	2,307	5,460
Hannibal and Quincy	366	462
Wisconsin group	98	228
Wichita	103	288
Cedar Rapids group	109	329
Dubuque, Burlington and Clinton	933	1,277
Denver, Pueblo and Salt Lake	392	3,699
Rockford, Freeport, Janesville and Beloit	133	169
	11,885	$30,650

It will be seen that the average increase of freight bills was $2.58 for each item corrected.

Westbound Shipments in 1889.

The statement of the joint committee shows that during the year 1889 1,245,710 tons of freight were shipped from New York by rail to the West. Of this amount 456,464 tons, or 36.64 per cent., went to Chicago and beyond. Of the grand total Chicago received 262,947 tons; St. Louis, 80,394 tons; Indianapolis, 18,975 tons; Peoria, 5,256 tons; Cincinnati, 63,920 tons, and Louisville, 16,978 tons. The percentages of the various lines out of New York were as follows:

New York Central	22.09
N. Y., L. E. & W	20.87
Pennsylvania	22.55
Baltimore & Ohio	6.39
D., L. & W	11.06
West Shore	9.65
Lehigh Valley	5.80
N. Y., O. & W	1.59
	100.00

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, March 13, amounted to 90,364 tons, against 93,696 tons during the preceding week, a decrease of 3,332 tons, and against 68,016 tons during the corresponding week of 1889, an increase of 22,348 tons. This includes flour, grain, seeds, provisions, dressed beef, hides, wool and lumber. The proportions carried by each road were:

	W'k to Mch. 8.		W'k to Mch. 15.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	10,938	12.1	12,440	13.3
Wabash	4,098	4.5	3,600	3.8
Lake Shore & Michigan South.	17,933	19.9	21,018	22.5
Pitts., Ft. Wayne & Chicago	11,968	13.3	11,988	12.8
Chicago, St. Louis & Pitts.	11,331	12 5	9,772	10.4
Baltimore & Ohio	13,104	14 5	9,480	10.1
Chicago & Grand Trunk	9,709	10.7	11,192	12.0
New York, Chic. & St. Louis	5,794	6.4	5,900	6 2
Chicago & Atlantic	5,489	6.1	8,306	8.9
Total	90,364	100.0	93,696	100.0

Of the above shipments 4,112 tons were flour, 51,629 tons grain, 2,298 tons millstuffs, 5,240 tons cured meats, 3,525 tons lard, 9,336 tons dressed beef, 1,370 tons butter, 1,576 tons hides, 176 tons wool and 5,932 tons lumber. The three Vanderbilt lines carried 38.4 per cent. of all the business, while the two Pennsylvania lines carried but 25.8 per cent.